Volume 30 JUNE, 1946 Number 6

BULLETIN
of the
American Association *of* Petroleum Geologists

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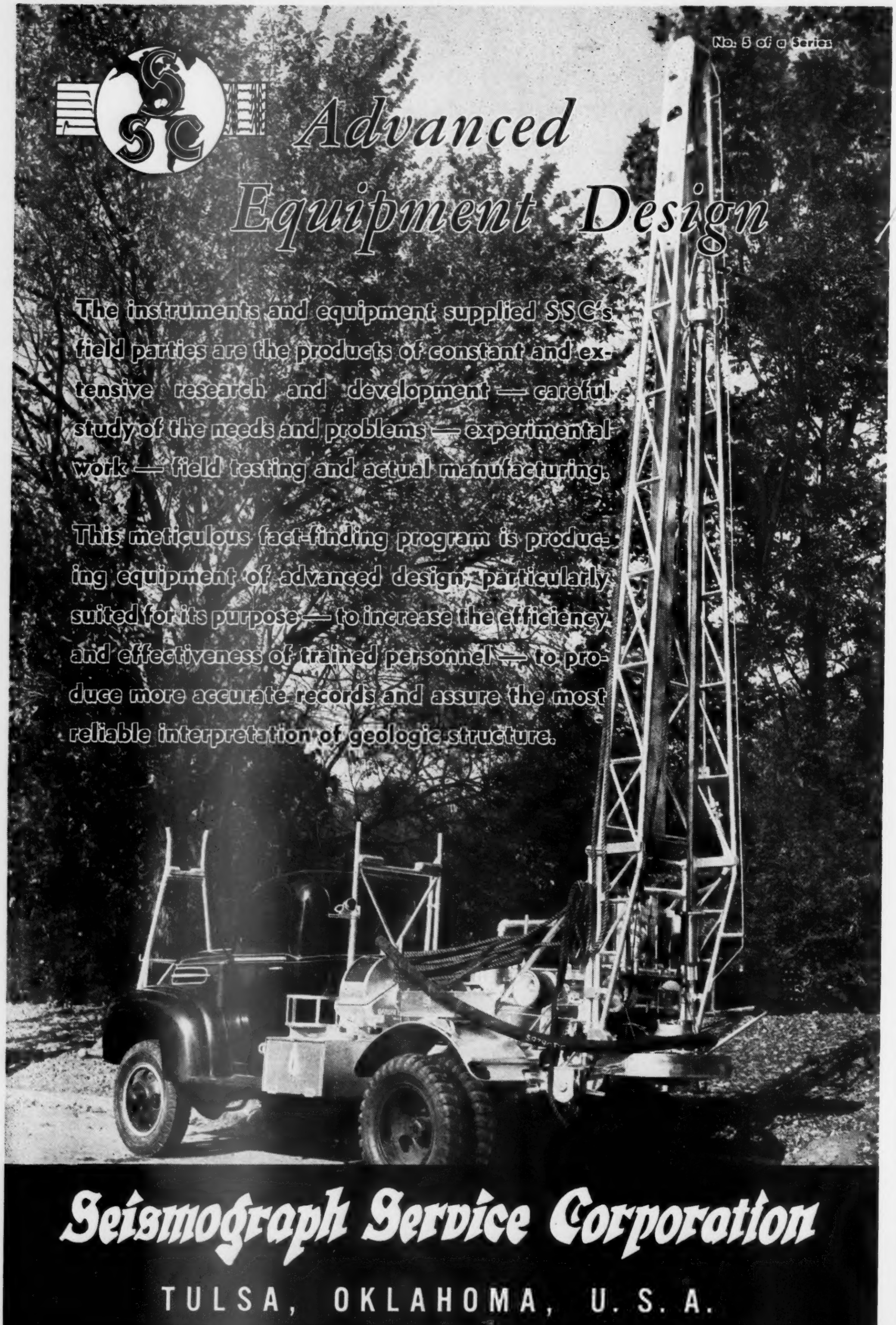
REVIEW OF EXPLORATION AND DEVELOPMENT IN 1945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BULLETIN

of the

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

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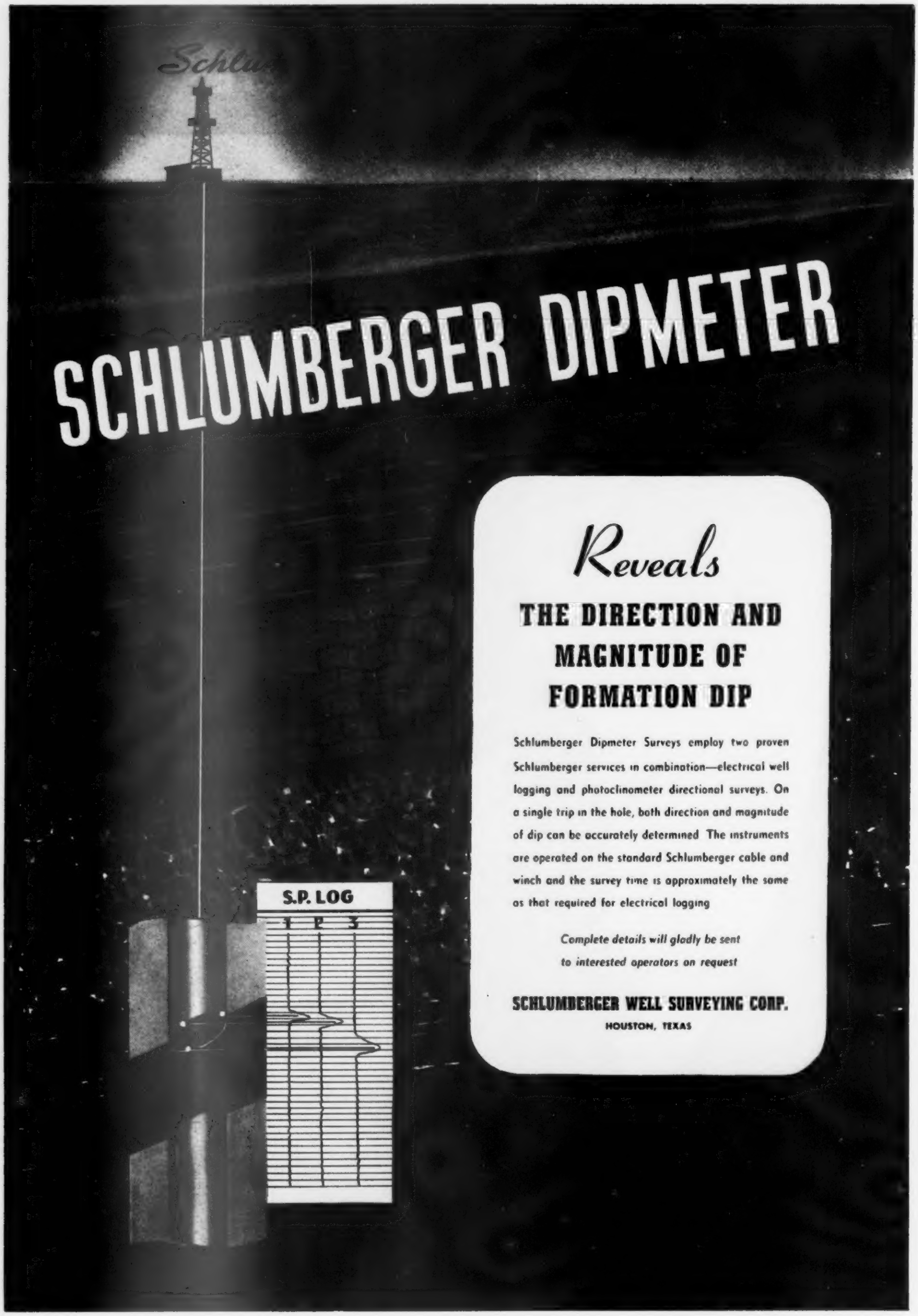
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Volume 30 Number 6

BULLETIN
of the
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

JUNE, 1946

EXPLORATORY DRILLING IN 1945[1]

FREDERIC H. LAHEE,[2] CHAIRMAN
Dallas, Texas

ABSTRACT

This is a compilation and study of statistics on exploratory drilling in 1945. It is the first report contributed as a result of the work of the Association's committee on statistics of exploratory drilling. However, in practically all respects it presents an analysis which is similar to, and continuous from, the earlier reports on exploratory drilling by the chairman.

During 1945, 5,613 exploratory holes were drilled in the United States. Of these, 3,036 were new-field wildcats, 1,364 were new-pool tests (including new-pool wildcats, deeper-pool tests, and shallower-pool tests), and 1,213 were outposts. Among the new-field wildcats, 351 were successful; among the new-pool tests, 383 were successful; and among the outposts, 480 were successful.

The total exploratory footage drilled was 23,030,266 feet in the 5,613 holes, or 4,103 feet per hole. These figures contrast with 20,225,887 feet drilled in 4,796 holes, with an average depth of 4,217 feet, in 1944.

Although the number of holes drilled and the footage drilled, and also the number of successful exploratory holes completed, all show an increase over 1944 and earlier years, the *degree* of success, measured in barrels of oil discovered, again reveals a decline. From these facts it is evident, as stated in previous reports on this subject, that we must aggressively continue all phases of the exploration program for petroleum.

This paper will serve at the same time as the first annual report of the committee on statistics of exploratory drilling and as a continuation of the annual articles previously published in this *Bulletin* by the present chairman.[3] For these

[1] Manuscript received, March 29, 1946. Read before the Association at Chicago, April 4, 1946.

[2] Chief geologist, Sun Oil Company.

[3] *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 21 (1937), pp. 1079–82.
"Wildcat Drilling in 1937," *ibid.*, Vol. 22, No. 6 (June, 1938), pp. 645–48.
"Further Data on Wildcat Drilling in 1937," *ibid.*, Vol. 22, No. 9 (September, 1938), pp. 1231–35.
"Wildcat Drilling in 1938," *ibid.*, Vol. 23, No. 6 (June, 1939), pp. 789–94.
"Wildcat Drilling in 1939," *ibid.*, Vol. 24, No. 6 (June, 1940), pp. 953–58.
"Wildcat Drilling in 1940," *ibid.*, Vol. 25, No. 6 (June, 1941), pp. 997–1003.
"Wildcat Drilling in 1941, with Comments on Discovery Rate," *ibid.*, Vol. 26, No. 6 (June, 1942), pp. 969–82.
"Wildcat Drilling in 1942," *ibid.*, Vol. 26, No. 6 (June, 1943), pp. 715–29.
"Classification of Exploratory Drilling and Statistics for 1943," *ibid.*, Vol. 27, No. 6 (June, 1944), pp. 701–21.
"Exploratory Drilling in 1944," *ibid.*, Vol. 29, No. 6 (June, 1945), pp. 629–45.
"Review of Exploratory Drilling Statistics 1938–44," *ibid.*, Vol. 29, No. 11 (November, 1945), pp. 1581–92.

earlier articles the data on exploratory drilling were collected for the different states and different districts by individuals who were interested in the subject, but not as a committee, and their data were sent in to the writer for compilation and study. A year ago the executive committee authorized organization of a special committee to handle this work and the writer of the earlier contributions was appointed chairman of this new committee, and Paul Weaver was made vice-chairman. In addition to the chairman and vice-chairman, 21 members were appointed. Fourteen of these 22 members had previously assisted Lahee in gathering data for the earlier years. In this way, it was possible to realize a considerable degree of continuity from the earlier work into the work of the newly organized committee.

Compilation of statistics of the kind discussed in this paper requires a great deal of care and time and perseverance. In each of those states where little drilling is accomplished, one member of the committee has been able to carry on alone. In states or districts where drilling is active and many wells are completed within the year, each member of the main committee has solicited the help of other men. In several areas a subcommittee was organized with the member of the main committee serving as its chairman. To all members of the committee and to the many others who assisted them the Association and the oil fraternity at large owe much gratitude, for all of them have spent a great deal of time and thought on their contributions without which this report would be impossible. Therefore the chairman takes pleasure in citing the names of those to whom credit is especially due. There were many others—clerks, stenographers, and draughtsmen—who also gave many hours of faithful service. The committee members are named in alphabetical order.

R. L. Bates was assisted by John A. Frost
A. H. Bell
J. E. Billingsley was assisted by R. C. Lafferty
Kendall E. Born
Kenneth C. Cottingham
Charles J. Deegan was assisted by Kenneth A. Ackley, Ed. F. Shea, Oscar Hatcher, George M. Kridler, and Ronald J. Cullen
S. G. Elder was assisted by H. S. Owen
Ralph E. Esarey was assisted by Stanley G. Elder and T. H. Robinson
Fenton H. Finn was assisted by George C. Grow (vice-chairman of his subcommittee), George J. Donaldson, Jack Gaddess, L. S. Matteson, J. G. Montgomery, J. J. Schmidt, D. T. Secor, J. B. Sparks, James F. Swain, and W. N. Tipka
W. Lloyd Haseltine was assisted by George M. Straughan
W. J. Hilseweck was assisted by a subcommittee which included Jackson M. Barton, W. B. Hoover, Jack Parker, and R. L. Boss
Coleman D. Hunter was assisted by Frank Fisher, Ralph Thomas, and Woodson Diamond
John W. Inkster was assisted by Paul H. Harper and John R. Berg
W. S. McCabe was assisted by a subcommittee which included H. E. Christensen, A. W. Cullen, E. W. Krampert, and R. L. Sielaff
John C. Miller was assisted by S. A. Berthiaume, V. H. Willis, and E. B. Wilson
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Graham B. Moody was assisted by K. Arleth, H. L. Driver, H. W. Lee, F. S. Parker, and R. L. Rist
D. J. Munroe
T. F. Petty was assisted by H. D. McCool and D. E. Shoemaker
Charles H. Row was assisted by J. M. Hansell, E. E. Martin, and L. C. Smith
Glenn C. Sleight
Paul Weaver was assisted by Walter B. Jones

In order to explain the functions of the committee and especially to systematize the methods of classification and compilation, the chairman met local groups headed by members of the main committee in 17 of the 22 major districts. As a consequence of these conferences, a rather voluminous correspondence, and the care exercised in tabulating and checking the statistics, we believe that the results are reliable, always, of course, with a small percentage of error due to the personal equation in classifying wells.

Our committee has used the classification of exploratory holes as outlined in Table I. Definitions of the several types of hole are given on pp. 631 to 634 of last year's summary.[4] Except where otherwise designated, the statistics recorded in this paper are similar to those used in our reports for 1939 to 1944 inclusive. We include wildcats (both new-field wildcats and new-pool wildcats), outpost wells, deeper-pool tests and shallower-pool tests. For all but the deeper-pool tests we use, as exploratory footage, the total footage drilled in each hole, whether a producer or a dry hole, but in the case of the deeper-pool tests we include only the footage drilled below the deepest producing formation penetrated by the well. Observe that if, in the drilling of wells in a given field, any *dry* footage is drilled *below* the deepest producing sand ("pay"), the stratigraphic equivalent of this dry footage in a subsequently drilled deeper-pool test is counted as exploratory. Thus, even though a field development well, "A," may have been carried from, let us say, 5,000 feet, which we shall assume is the base of the deepest pool in the field, to 6000, feet, and plugged back for completion at 5,000, feet, a deeper-pool test, "B," drilled near this well "A," and carried to 8,000 feet would still have assigned to it 3,000 feet of exploratory footage. This is analogous to the case of a second new-field wildcat, "D," drilled offsetting, or close to, a dry and abandoned previously drilled new-field wildcat, "C," for "D," just like "C," is assigned its entire depth, from the surface down to the bottom, as exploratory footage.

On the maps (Figs. 1 and 2), numbers in parentheses indicate total footage drilled; figures preceding parentheses indicate the number of holes drilled; figures above the cross line are for producing wells, that is, oil, oil and gas, condensate (distillate) and gas, and gas; and figures below the cross line are for dry holes.

In the states covered in this review, as shown in Figure 1, and listed in Table II, during 1945 a total of 23,030,266 feet was drilled in 5,613 exploratory holes, divided as follows:

	Feet
1,214 producers	5,501,702
4,399 dry holes	17,528,564

This means that 21.6 per cent of the holes drilled, and 23.9 per cent of the footage drilled, were successful in 1945. One producer foot was drilled for every 3.19 feet of dry hole. One successful well was drilled for every 3.62 dry holes. The average depth of hole was 4,103 feet.

[4] "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), pp. 629–45.

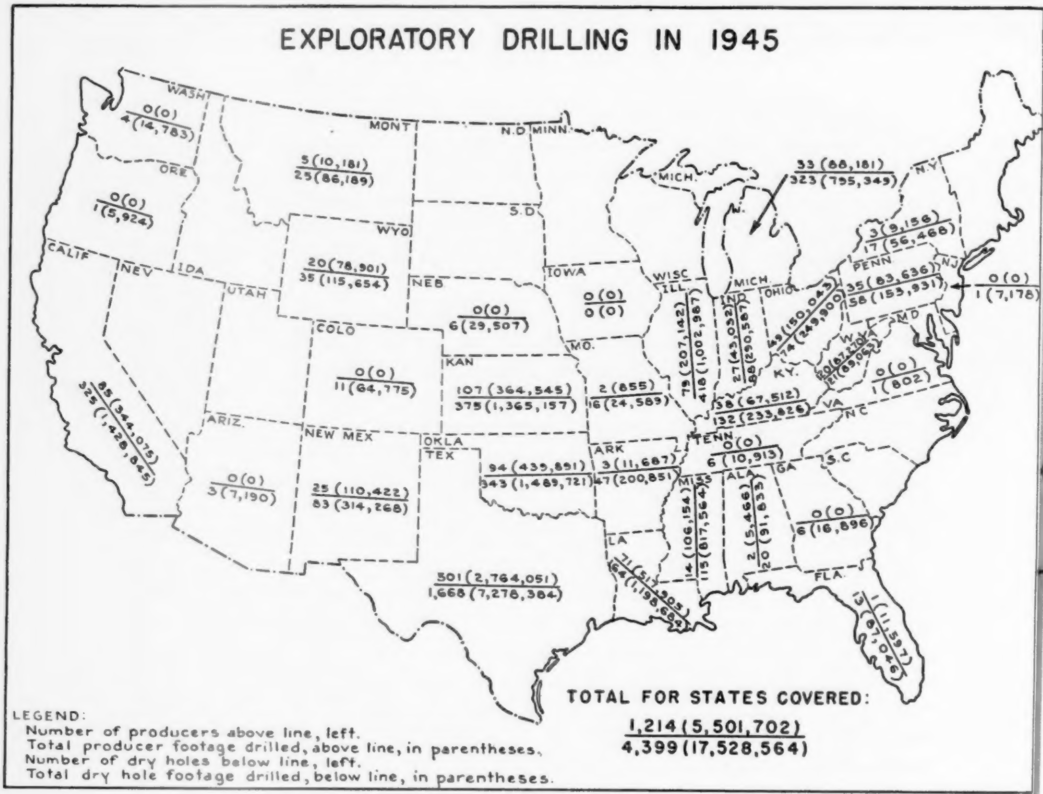


FIG. 1

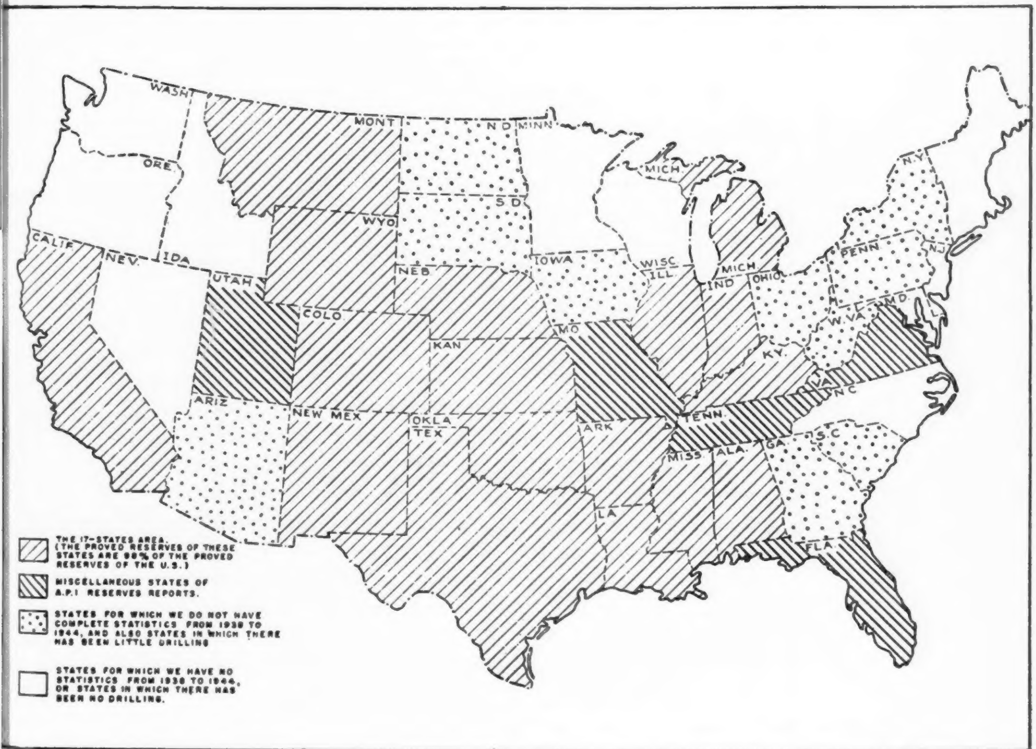
TABLE I

CLASSIFICATION OF EXPLORATORY WELLS

				Classification when drilling is started	Classification after completion or abandonment: Successful	Classification after completion or abandonment: Unsuccessful
				A	B	C
Drilling for long extension of partly developed pool.				1 Outpost	1 Extension well (sometimes a new-pool discovery well)	1 Dry outpost well
Drilling for a new pool on a structure or in a geological environment already productive.	New-pool tests	Drilling within limits of area of pool.	For new pool above deepest pool.	2a Shallower-pool test	New-pool discovery wells: 2a Shallower-pool discovery well	Dry new-pool tests: 2a Dry shallower-pool test
			For new pool below deepest pool.	2b Deeper-pool test	2b Deeper-pool discovery well	2b Dry deeper-pool test
		Drilling outside limits of developed pools		2c New-pool wildcat	2c New pool discovery wildcat (sometimes an extension well)	2c Dry new-pool wildcat
Drilling for a new field (i.e., on a structure or in an environment never before productive).				3 New-field wildcat	3 New-field discovery wildcat	3 Dry new-field wildcat


SE. NEW MEXICO
21(91,441)
60(253,344)
11(35,651)
19(106,522)
OKLAHOMA
81(328,998)
317(903,886)
79(425,531)
206(1,113,314)
20(64,576)
153(417,363)
12(89,868)
49(241133)
9(55,019)
57(372,681)
TEXAS
12(56,986)
62(231 705)
98(510,443)
305(1,092,888)
11(49,088)
93(355,479)
73(486204)
154(840,314)
98(510 443)
305(1,092,888)
TOTAL TEXAS:
501(2,764,051)
1,668(7,278,384)
TEXAS RAILROAD COMMISSION DISTRICTS
ARKANSAS
3(11,687)
47(200,851)
LOUISIANA
20(128,780)
89(466,289)
51(389,125)
75(732,395)
TOTAL LOUISIANA:
71(517 905)
164(1,198,684)
MISSISSIPPI
14(106,154)
115(817,564)
ALABAMA
2(5466)
20(91,833)
GEORGIA
0(0)
6(16,896)
SOUTH CAROLINA
FLORIDA
1(11,597)
13(87,046)
TOTAL
613(3,508,301)
2,093(9,944,302)
ONE PRODUCER FOOT
FOR EVERY
2.83 FEET DRY
EXPLORATORY WELLS, 1945

FIG. 2


WASH
ORE.
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TENN
MISS
ALA.
GA.
FLA
S.C.
N.C.
VA.
W.VA.
MD.
PENN
N.Y.
NJ
THE 17-STATES AREA. (THE PROVED RESERVES OF THESE STATES ARE 98% OF THE PROVED RESERVES OF THE U.S.)
MISCELLANEOUS STATES OF A.P.I RESERVES REPORTS.
STATES FOR WHICH WE DO NOT HAVE COMPLETE STATISTICS FROM 1938 TO 1944, AND ALSO STATES IN WHICH THERE HAS BEEN LITTLE DRILLING
STATES FOR WHICH WE HAVE NO STATISTICS FROM 1938 TO 1944, OR STATES IN WHICH THERE HAS BEEN NO DRILLING.

FIG. 3

TABLE II

NUMBER OF OIL WELLS, GAS WELLS, CONDENSATE WELLS, AND DRY HOLES DRILLED AS EXPLORATORY TESTS IN 1945

States*	Oil Producers		Gas Producers		Condensate Producers		Total Producers		Dry		Grand Totals		Average Depth of Hole[1]
	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	Number of Holes	Footage Drilled	
Alabama	1	3,461	1	2,005	0	0	2	5,466	20	91,833	22	97,299	
Arizona	0	0	0	0	0	0	0	0	3	7,190	3	7,190	
Arkansas	3	11,687	0	0	0	0	3	11,687	47	200,851	50	212,538	4,251
California	76	307,394	9	36,681	0	0	85	344,075	325	1,428,845	410	1,772,920	4,324
Colorado	0	0	0	0	0	0	0	0	11	64,775	11	64,775	
Florida	1	11,597	0	0	0	0	1	11,597	13	87,046	14	98,643	
Georgia	0	0	0	0	0	0	0	0	6	16,896	6	16,896	
Illinois	79	207,142	0	0	0	0	79	207,142	418	1,002,987	497	1,210,129	2,435
Indiana	23	39,692	4	3,340	0	0	27	43,032	88	290,587	115	333,619	2,901
Kansas	83	276,206	24	88,339	0	0	107	364,545	375	1,365,157	482	1,729,702	3,589
Kentucky	27	44,742	11	22,770	0	0	38	67,512	132	233,826	170	301,338	1,773
Louisiana	46	350,523	15	83,662	10	83,720	71	517,905	164	1,198,684	235	1,716,589	7,305
Maryland	0	0	0	0	0	0	0	0	1	7,178	1	7,178	
Michigan	20	55,430	12	27,553	1	5,198	33	88,181	323	795,349	356	883,530	2,482
Mississippi	10	67,940	0	0	4	38,214	14	106,154	115	817,564	129	923,718	7,161
Missouri	0	0	2	855	0	0	2	855	16	24,589	18	25,444	
Montana	5	10,181	0	0	0	0	5	10,181	25	86,189	30	96,370	3,212
Nebraska	0	0	0	0	0	0	0	0	6	29,507	6	29,507	
New Mexico	18	83,405	7	27,017	0	0	25	110,422	83	314,268	108	424,690	3,932
New York	0	0	3	9,156	0	0	3	9,156	17	56,468	20	65,624	
Ohio	12	44,516	37	105,527	0	0	49	150,043	74	249,900	123	399,943	3,252
Oklahoma	78	385,824	16	54,067	0	0	94	439,891	343	1,489,721	437	1,929,612	4,416
Oregon	0	0	0	0	0	0	0	0	1	5,924	1	5,924	
Pennsylvania	1	2,685	34	80,951	0	0	35	83,636	58	153,931	93	237,567	2,554
Tennessee	0	0	0	0	0	0	0	0	6	10,913	6	10,913	
Texas	341	1,771,449	75	325,573	85	667,029	501	2,764,051	1,668	7,278,084	2,169	10,042,135	4,630
Virginia	0	0	0	0	0	0	0	0	1	802	1	802	
Washington	0	0	0	0	0	0	0	0	4	14,783	4	14,783	
West Virginia	0	0	20	87,270	0	0	20	87,270	21	89,063	41	174,333	4,252
Wyoming	16	59,924	4	18,977	0	0	20	78,901	35	115,654	55	194,555	3,437
Totals	840	3,733,798	274	973,743	100	794,161	1,214	5,501,702	4,399	17,528,564	5,613	23,030,266	4,103

* No exploratory drilling was reported in Iowa, Nevada, North Carolina, North Dakota, South Carolina, South Dakota, or Utah.

[1] Averages have been recorded here only for states where more than 25 exploratory holes were drilled in 1945.

In the southern states district (Fig. 2), in 1945, a total of 13,452,603 feet was drilled in 2,706 holes, divided as follows:

	Feet
613 producers	3,508,301
2,093 dry holes	9,944,302

In this area, then, 22.7 per cent of the holes drilled, and 26.1 per cent of the footage drilled, were successful. One producer foot was drilled for every 2.83 feet of dry hole. One successful well was drilled for every 3.41 dry holes. The average depth of hole was 4,971 feet. For comparison with statistics for this same area in 1938, 1939, 1940, 1941, 1942, 1943, and 1944, see Table III.

Selection of the location for a wildcat well may be based on geology (surface geology, subsurface geology, trend along known structural or stratigraphic conditions, local or regional, or shallow exploratory drilling); or it may be based on geophysics (exploration by seismograph, torsion balance, gravity meter, magnetometer, et cetera); or it may be based on some non-technical suggestion or requirement, such as "creekology," "hunch," "doodle-bug," promotion, lease obligation, reported showing of oil or gas in holes previously drilled, et cetera. In many cases a block of acreage is taken on trend, or gravity exploration, or magnetic exploration, et cetera, and subsequently the well is located within the block by some more detailed work, such as seismic exploration. We believe that in such cases credit should be given to both the reconnaissance method and the detailed method of exploration. Sometimes the reason for choosing the location can not be ascertained, and it is then recorded as "unknown."

In Table IV are listed the reasons for drilling the exploratory holes in 1945, by using the best information available from men familiar with such statistics, each in his own state or district. According to these figures 1,115 exploratory holes drilled on technical advice (geology and/or geophysics) were successful, and 3,697 were dry; 47 holes, located for non-technical reasons, were producers, and 404 were dry; 52 producers and 298 dry holes were located for reasons unknown. These figures show that 23.2 per cent of the holes drilled on technical advice were producers as contrasted with 10.4 per cent successful in the case of the holes located without technical advice. Therefore, in 1945, locations based on technical recommendations were 2.2 times as successful as those drilled without such advice.

Comparing last year's figures[5] with figures for 1945, we note the following.

1. There was a very large increase in exploratory drilling in the United States, amounting to an increase of 17 per cent of holes drilled in 1944, and nearly 14 per cent of exploratory footage drilled in 1944.

2. There was an increase in exploratory drilling in most of the states, but the number of holes remained nearly the same in 1945 as in 1944 in Kentucky, Louisiana, and Michigan, and there was a decrease in exploratory holes drilled in Arkansas.

[5] F. H. Lahee, "Exploratory Drilling in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), pp. 629–45.

TABLE III

COMPARATIVE STATISTICS FOR SOUTHERN STATES, SHOWN IN FIGURE 2*

Year	Producers Drilled				Dry Holes Drilled				Total Number Explor. Holes Drilled	Total Feet Drilled	Average Depth of Hole (Feet)	Number of Dry-Hole Feet Drilled for Each Producer Foot
	Holes		Footage		Holes		Footage					
	Number	Per Cent	Feet	Per Cent	Number	Per Cent	Feet	Per Cent				
1938	200	13.6	984,262	17.4	1,271	86.4	4,667,402	82.6	1,471	5,651,664	3,842	4.74
1939	161	12.6	779,345	14.8	1,113	87.4	4,501,669	85.2	1,274	5,281,014	4,145	5.90
1940	187	12.8	919,506	14.9[1]	1,279	87.2	5,251,273[1]	85.1[1]	1,466	6,170,779	4,209[1]	5.71[1]
1941	258	16.5	1,264,774	18.4	1,305	83.5	5,578,975	81.6	1,563	6,843,749	4,372	4.41
1942	231	16.3	1,289,480	19.6	1,186	83.7	5,295,556	80.4	1,417	6,585,036	4,647	4.11
1943	287	17.3	1,546,956	18.8	1,369	82.7	6,680,512	81.2	1,656	8,227,468	4,968	4.32
1944	473	21.1	2,804,005	23.5	1,765	78.9	9,095,421	76.5	2,238	11,899,426	5,317	3.24
1945	613	22.7	3,508,301	26.1	2,093	77.3	9,944,302	73.9	2,706	13,452,603	4,971	2.83

* In this table New Mexico data are from the southeastern part of the state only.
[1] See *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 25, p. 1938, where corrections are mentioned for these figures as they appeared in Table II, p. 1001, of the same volume.

3. The average depth of hole decreased from 4,217 feet to 4,103 feet, for the country as a whole.

4. In 6 states (California, Indiana, Montana, New Mexico, Ohio, and Oklahoma) the average depth of hole increased, but in all the other 11 states where more than 25 exploratory holes were drilled in 1945, there was a decrease in the average depth per hole.

In former annual reports we have studied conditions in a group of 11 selected

TABLE IV

BASIS FOR LOCATING EXPLORATORY HOLES DRILLED IN 1945

State	*Geology*		*Geophysics**		*Geology and Geophysics**		*Sundry Non-Technical*		*Unknown*		*Totals*		*Grand Total*
	Prod.	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	
Alabama	1	4	0	9	0	2	0	3	1	2	2	20	22
Arizona	0	0	0	0	0	0	0	3	0	0	0	3	3
Arkansas	2	29	1	8	0	4	0	4	0	2	3	47	50
California	73	195	1	40	10	34	1	56	0	0	85	325	410
Colorado	0	9	0	1	0	1	0	0	0	0	0	11	11
Florida	1	4	0	3	0	2	0	4	0	0	1	13	14
Georgia	0	0	0	0	0	2	0	4	0	0	0	6	6
Illinois	66	303	1	14	9	35	2	58	1	8	79	418	497
Indiana	22	47	1	13	2	8	0	7	2	13	27	88	115
Kansas	76	207	12	35	1	4	18	128	0	1	107	375	482
Kentucky	29	92	1	4	1	0	5	16	2	20	38	132	170
Louisiana	35	75	21	61	15	27	0	1	0	0	71	164	235
Maryland	0	0	0	0	0	1	0	0	0	0	0	1	1
Michigan	32	268	1	9	0	0	0	25	0	21	33	323	356
Mississippi	2	21	7	69	5	16	0	1	0	8	14	115	129
Missouri	2	1	0	0	0	0	0	13	0	2	2	16	18
Montana	4	15	0	2	1	1	0	7	0	0	5	25	30
Nebraska	0	0	0	1	0	0	0	4	0	1	0	6	6
New Mexico	18	45	1	12	2	8	1	4	3	14	25	83	108
New York	2	16	0	0	0	0	1	0	0	1	3	17	20
Ohio	22	24	0	2	0	0	1	8	26	40	49	74	123
Oklahoma	41	195	29	73	12	22	2	10	10	43	94	343	437
Oregon	0	1	0	0	0	0	0	0	0	0	0	1	1
Pennsylvania	23	33	0	2	0	2	9	7	3	14	35	58	93
Tennessee	0	5	0	0	0	0	0	1	0	0	0	6	6
Texas	355	1,198	66	191	77	149	0	27	3	103	501	1,668	2,169
Virginia	0	0	0	0	0	0	0	0	0	1	0	1	1
Washington	0	0	0	0	0	0	0	0	0	4	0	4	4
West Virginia	12	10	0	0	0	0	7	11	1	0	20	21	41
Wyoming	15	30	0	1	5	2	0	2	0	0	20	35	55
Totals	833	2,827	142	550	140	320	47	404	52	298	1,214	4,399	5,613

* Including geochemistry.

states. In the general review of all our previous reports, printed late last year,[6] we compared statistics for a group of 17 states (Fig. 3). Each year, from 1938 to 1945, inclusive, these 17 states have included 98 per cent of the proved oil reserves of the country. For this reason their study gives essentially a picture of conditions in the United States where we want to compare exploration activities and additions of new oil from year to year. For the near future we shall discontinue reference to the 11-states area, but will continue our study of the 17-states area.

In Table V we present an analysis of the five classes of exploratory hole (Table I), and this is done both for the 17-states area and for the entire United

[6] "Review of Exploratory Drilling Statistics, 1938–1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 11 (November, 1945), pp. 1581–92.

TABLE V

Distribution of Exploratory Wells of 1944 and 1945 by Classes and Results of Drilling

		17-States Area						All States Reported					
		1944			1945			1944			1945		
		Number	Well Per Cent	Class Per Cent	Number	Well Per Cent	Class Per Cent	Number	Well Per Cent	Class Per Cent	Number	Well Per Cent	Class Per Cent
Outposts	Producers	286	42.37		424	38.09		315	41.72		480	39.57	
	Dry holes	383	57.63		689	61.91		440	58.28		733	60.43	
	Totals	669	100.00	14.70	1,113	100.00	21.07	755	100.00	15.74	1,213	100.00	21.61
New-pool wildcats	Producers	158	24.30		207	25.30		179	25.35		236	26.14	
	Dry holes	492	75.70		611	74.70		527	74.65		767	73.86	
	Totals	650	100.00	14.29	818	100.00	15.49	706	100.00	14.51	903	100.00	16.09
Deeper-pool tests	Producers	87	44.84		106	26.56		90	41.86		114	27.08	
	Dry holes	107	55.16		293	73.44		125	58.14		307	72.92	
	Totals	194	100.00	4.26	399	100.00	7.55	215	100.00	4.48	421	100.00	7.50
Shallower-pool tests	Producers	17	73.92		32	82.06		18	69.24		33	82.50	
	Dry holes	6	26.08		7	17.94		8	30.76		7	17.50	
	Totals	23	100.00	.51	39	100.00	.74	26	100.00	.54	40	100.00	.71
New-field wildcats	Producers	330	10.95		335	11.50		342	11.03		351	11.37	
	Dry holes	2,684	89.05		2,578	88.50		2,752	88.97		2,685	88.63	
	Totals	3,014	100.00	66.24	2,913	100.00	55.15	3,094	100.00	64.73	3,036	100.00	54.09
Total producers		878	19.29		1,104	20.90		944	19.68		1,214	21.63	
Total dry holes		3,672	80.71		4,178	79.10		3,852	80.32		4,399	78.37	
Grand total		4,550	100.00	100.00	5,282	100.00	100.00	4,796	100.00	100.00	5,613	100.00	100.00

States. Observe that the percentages for both areas are very nearly the same for each year. This, of course, would be expected since so much of the exploratory drilling of the country occurs in these 17 states. As between the two years, there is some variation, some of which undoubtedly is due to the personal equation in defining and classifying exploratory holes. As the work of the committee goes forward, we shall be able to iron out this factor. In any case, we believe it is well within 5 per cent of the total of any group. If we wished to use round numbers for averages between these two years of 1944 and 1945, we might say that new-field wildcats constitute about 60.4 per cent of all the exploratory holes drilled; outposts about 18 per cent; new-pool wildcats about 15 per cent; deeper-pool tests about 6 per cent; and shallower-pool tests about 0.6 per cent. Together, then, the new-pool tests (the last three) would constitute 21.6 per cent of the total. Or, putting this in still more general form, we may say that exploratory drilling is roughly divisible into 60 per cent which is wildcatting for new fields, 20 per cent which is drilling for new pools on structures already producing, and 20 per cent which is outpost drilling for long-distance extensions of pools already partly developed.

In 1945, in the 351 successful new-field wildcats, 1,789,392 feet were drilled, and 11,579,395 feet were drilled in the 2,685 dry new-field wildcats. Analogous figures, in 1944, were 1,640,473 feet drilled in the 342 successful new-field wildcats of that year, and 11,417,643 feet drilled in the 2,752 dry new-field wildcats. These figures indicate that, in new-field wildcats in the country as a whole, the average depth was 4,220 feet in 1944 and 4,403 feet in 1945.

In Tables VI and VII are listed comparative data for the 17-states area, many of them similar to those presented for the United States in Tables II and IV, but in Tables VI and VII only annual totals are given. Details by states can be obtained from the earlier reports.

We wish to call particular attention to columns A, B, and C in Table VI. Here we show that, although, since 1940 (with the exception of 1942), there has been an increasing number of successful exploratory holes, nevertheless in that same period the percentage of new-field discoveries has steadily decreased. In 1945 this percentage was less than half what it was in 1940. Significant also is the fact that, since 1939, there has been apparent an improvement in the producer-dry-hole ratio from 8.71 dry holes per producer to 3.78 dry holes per producer, and from 6.80 feet drilled in dry holes per foot in producers to 3.56 feet drilled in dry holes per foot in producers. In other words exploratory drilling has been increasingly successful in finding new oil and gas—we are not referring here to *quantity* of new oil and gas—in outpost drilling and in new-pool drilling, but it has been decreasingly successful in finding new oil and gas in new-field ("rank wildcat") drilling.

In Table VIII are listed annual statistics comparing the American Petroleum Institute's figures on proved oil reserves[7] with our figures on exploratory drilling.

[7] We have taken totals of the reserves figures published by the A.P.I. each year for the 17 states.

TABLE VI

STATISTICS ON EXPLORATORY HOLES AND FOOTAGE DRILLED, AND ON AVERAGE DEPTH OF EXPLORATORY HOLE, IN 17-STATES AREA

	A	B	C	D	E	F	G	H	I	J	K
	Successful Exploratory Wells										
Year	*Total Number of Producers**	*New-Field Discovery Wells*	*B is What Per Cent of A*	*Number of Dry Explora-tory Holes*	*Total Explora-tory Holes (A+D)*	*Number of Dry Explora-tory Holes Drilled for Each Producer (D/A)*	*Total Footage in Successful Exploratory Holes*	*Total Footage in Dry Exploratory Holes*	*Number of Feet Drilled in Dry Holes for Each Foot in Pro-ducers (H/G)*	*Total Exploratory Footage (G+H)*	*Average Depth of Explora-tory Hole (J/E)*
1938	294 oil, 75 gas } 369	226	61.2	2,264	2,633	6.13	1,526,557	7,303,609	4.78	8,830,166	3,354
1939	226 oil, 49 gas } 275	175	63.6	2,396	2,671	8.71	1,118,420	7,610,632	6.80	8,729,052	3,268
1940	299 oil, 64 gas } 363	238	65.5	2,618	2,981	7.21	1,419,875	8,635,624	6.08	10,055,499	3,373
1941	416 oil, 86 gas } 502	281	55.9	2,716	3,218	5.41	2,045,769	9,488,962	4.63	11,534,731	3,584
1942	408 oil, 82 gas } 490	263	53.6	2,690	3,180	5.48	2,155,522	9,894,844	4.59	12,050,366	3,789
1943	526 oil, 118 gas } 644	288	44.7	3,144	3,788	4.88	2,714,855	12,235,454	4.51	14,950,309	3,947
1944	697 oil, 181 gas } 878	330	37.6	3,672	4,550	4.18	4,190,732	15,228,020	3.63	19,418,752	4,268
1945	826 oil, 278 gas } 1,104	335	30.3	4,178	5,282	3.78	5,159,145	16,803,881	3.56	21,963,026	4,007

* In this Column "gas" includes both gas wells and gas plus condensate wells.

This comparison is suggestive, but it is not quite precise, and for this reason: the estimated "new proved reserves" (columns C and E) include, for each year, newly discovered proved reserves and also new proved reserves resulting from extensions of pools or fields previously discovered.[8] This new oil by extensions

TABLE VII

SUMMARY OF STATISTICS ON BASIS FOR LOCATING EXPLORATORY HOLES IN 17-STATES AREA

Year	*Geology*		*Geophysics*		*Geology and Geophysics*		*Sundry Non-Technical*		*Unknown*		*Totals*		*Grand Total*
	Prod.	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	*Prod.*	*Dry*	
1938	192	1,039	78	251	31	67	44	535	24	372	369	2,264	2,633
1939	140	1,100	69	393	13	40	43	662	10	201	275	2,396	2,671
1940	195	1,195	100	443	22	79	35	770	11	131	363	2,618	2,981
1941	300	1,357	143	432	28	111	29	755	2	61	502	2,716	3,218
1942	305	1,418	110	484	42	134	22	575	11	79	490	2,690	3,180
1943	405	1,813	147	538	65	242	21	480	6	71	644	3,144	3,788
1944	568	2,014	145	643	102	263	58	672	5	80	878	3,672	4,550
1945	771	2,733	142	543	140	313	29	353	22	236	1,104	4,178	5,282

TABLE VIII

SUMMARY OF STATISTICS ON PROVED RESERVES AND EXPLORATORY DRILLING IN 17-STATES AREA (See Fig. 3)

Year	A	B	C	D	E	F	G	H	I
	Proved Reserves as of Jan. 1 (1,000's of Bbls.)	*Proved Reserves as of Dec. 31* (1,000's of Bbls.)*	*Net New Proved Reserves (1,000's of Bbls.)*	*Production During Year (1,000's of Bbls.)*	*Gross New Proved Reserves (C+D) (1,000's of Bbls.)*	*Total Exploratory Footage (Feet)*	*New Proved Reserves (E) per Exploratory Foot Drilled (Bbls.)*	*Total Number of Exploratory Holes Drilled*	*New Proved Reserves (E) per Exploratory Hole Drilled (Bbls.)*
1938	15,102,239	17,056,370	1,954,131	1,183,733	3,137,864	8,830,166	355.3	2,633	1,191,744
1939	17,056,370	18,186,767	1,130,397	1,235,013	2,365,410	8,729,052	270.9	2,671	885,589
1940	18,186,767	18,688,777	502,010	1,322,794	1,824,804	10,055,499	181.5	2,981	612,161
1941	18,688,777	19,270,869	582,092	1,375,411	1,957,503	11,534,731	169.7	3,218	608,298
1942	19,270,869	19,792,818	521,949	1,355,102	1,877,051	12,050,366	155.7	3,180	590,267
1943	19,792,818	19,759,516	−33,302	1,475,881	1,442,579	14,950,309	96.5	3,788	380,828
1944	19,759,516	20,171,588	412,072	1,653,453	2,065,525	19,418,752	106.0	4,550	453,961
1945	20,171,588	20,566,405	394,817	1,713,725	2,108,542	21,963,026	96.0	5,282	399,194

* This figure happens to be 98 per cent of the total proved reserves of the United States as of the same date each year

is very largely a result of regular field development, not of exploratory drilling. In fact, some study of this matter leads us to conclude that probably not more than 2 per cent—certainly not more than 5 per cent— of the new proved reserves added by extensions in any given year is attributable to exploratory drilling. It is nearly all to be credited to field development drilling. However, this "extension oil," each year, is really a follow-up of the discoveries of several preceding years. In this sense certain fractions of it might be credited to years gone by, but this would involve many serious difficulties. We believe that it is better to refer to the simpler picture as presented in Table VIII, keeping in mind that columns G and I do not actually measure the results of the exploratory effort for any

[8] We need not concern ourselves here with revisions due to correction of factors used in making the sereserves estimates.

given year. If a somewhat closer analysis is sought, an approach to the problem can be made similar to that illustrated in Table V, on page 1589 of our "Review."[9]

As indicated in Table I, a hole may be located as an outpost with the intention of trying to extend a pool partly developed, but instead it may discover a new pool; and, similarly, a new-pool wildcat may be located in search of a new pool because it is believed to be well outside the limits of the known pool, but instead it may end up by extending this known pool farther than had been expected. A majority of outposts, if successful, are completed as extension wells

TABLE IX

NEW-POOL DISCOVERIES AND EXTENSIONS OF OLDER POOLS IN 1945

		New Pools Discovered: By Outposts	New Pools Discovered: By New-Pool Wildcats	New Pools Discovered: By Deeper-Pool Tests	New Pools Discovered: By Shallower-Pool Tests	Total New Pools Discovered in 1945	Extension of Old Pools: By Outposts	Extension of Old Pools: By New-Pool Wildcats	Total Extensions
A } 17-States area	Oil	60	122	81	20	283	264	40	304
	Gas	18	14	14	12	58	50	8	58
	Condensate	14	10	11	0	35	20	2	22
B } Remaining states	Oil	0	1	0	1	2	12	0	12
	Gas	5	17	8	0	30	39	11	50
	Condensate	0	0	0	0	0	0	0	0
C } Total U.S. (A+B)	Oil	60	123	81	21	285	276	40	316
	Gas	23	31	22	12	88	89	19	108
	Condensate	14	10	11	0	35	20	2	22
Grand total (Oil+gas+condensate)		97	164	114	33	408	385	61	446

and a majority of new-pool wildcats, if successful, discover new pools. To show the class distribution of these completions in 1945, we prepared Table IX. Here we see that 385 outposts were completed as extension wells and 97 were completed as new-pool discoveries; and 164 new-pool wildcats discovered new pools whereas 61 new-pool wildcats were completed as extension wells. It is further interesting to note, referring to both Tables V and IX, that in the 17-states area, in 1945, 335 new fields and 376 new pools were discovered, as compared with 384 extensions, and that in the entire country there were 351 new-field discoveries and 408 new-pool discoveries, compared with 446 extensions.[10]

A question sometimes asked concerns the approximate percentage of true wildcatting (new-field wildcatting) by major companies, on the one hand, and by minor companies and independents, on the other hand. Distinction between these three classes of operator is not always easy, and in some instances the same

[9] "Review of Exploratory Drilling Statistics," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 11 (November, 1945), pp. 1581–92.

[10] The new-pool discoveries referred to in this paper are all the result of exploratory drilling. In addition to these, at least 45 new pools were discovered in the drilling of field-development wells. These included 13 discoveries of gas and 32 of oil. Probably there were more, but this year we do not have complete statistics on this phase of the subject.

company may be regarded as a "major" in one district, but as a "minor" in another district. Consequently we left the classification to the judgment of the various committeemen each for his own district. Usually a major company is defined as one which is integrated with respect to at least three of the four main branches of production, transportation, refining, and marketing.

Our statistics showed that in the country as a whole, 894 new-field wildcats (158 producers and 736 dry holes) were drilled by majors; 1,854 new-field wildcats (165 producers and 1,689 dry holes) were drilled by minors and independents; and 288 new-field wildcats (28 producers and 260 dry holes) were drilled by minors or independents with the drilling financed by major companies. Corresponding figures for the 17-states area were 843 new-field wildcats (150 producers and 693 dry holes) by majors; 1,783 new-field wildcats (157 producers and 1,626 dry holes) by minors and independents; and 287 new-field wildcats (28 producers and 259 dry holes) by minors and independents with the drilling financed by majors.

In our "Review of Exploratory Drilling Statistics," already cited, on pages 1590 and 1591, and in Table VI of that article, we compared estimates of total ultimate reserves of the fields discovered in the 17-states area in the years 1938 to 1943 inclusive, these estimates being made, not at the time of discovery, but all of them as of January 1, 1945. Since the fields in 1943 were the latest considered in that study, all of them had at least a year of development history on January 1, 1945, to help toward a reasonably fair estimate. The older fields had a correspondingly longer period of development history to serve as a guide. In making the estimates the reserves of pools subsequently discovered on a producing structure were all added to the reserves of the first pool discovered on that structure, and the total of these pool reserves was assigned to the year of discovery of the first pool. No fields were included in the study except those of which the first pool was discovered within the 6-year period (1938 to 1943).

In accordance with our suggestion made in the "Review," our committee has made a re-appraisal of the fields discovered in those six years in the 17-states area, and has added estimates of the total ultimate reserves for the new-field discoveries of 1944 in the same area. Table X presents these estimates which were made as of January 1, 1946. As a result of the re-appraisal a few fields were dropped from the list because they were gas fields. Of the fields estimated as "E" on January 1, 1944, 5 discovered in 1938 were reported abandoned during 1945; and 5 of the 1939 discoveries, 4 of the 1940 discoveries, 11 of the 1941 discoveries, 7 of the 1942 discoveries, and 2 of the 1943 discoveries, were all reported as abandoned during 1945. In the re-appraisal, 2 A-fields were lowered to B (that is, the total ultimate reserves estimated as more than 50 million barrels a year ago are now placed between 25 and 50 million barrels); 2 B-fields were raised to A; 8 B-fields were lowered to C; 2 C-fields were raised to B; 2 C-fields were lowered to D; 40 D-fields were raised to C; 11 D-fields were lowered to E; and 41 E-fields were raised to D. Among all the 1,566 discoveries made in the 6-year

period, the estimates were raised in 85 cases and lowered in 13 cases, a comparison which suggests that these estimates were definitely on the conservative side. If we add together the A-fields, B-fields, and C-fields for each year, that is, all fields having total ultimate reserves of 10 million barrels or more, and find the percentage of these totals in the whole group of fields (A to E inclusive) for each year, we observe a regularly decreasing percentage (see last column in Table X).

TABLE X

NUMBER OF FIELDS DISCOVERED EACH YEAR IN 17-STATES AREA, GROUPED ACCORDING TO ESTIMATED TOTAL ULTIMATE RESERVES

Year	*Reserves Group**					*Total A-E, Incl.*	*Percentage of A+B+C Fields in Total Fields*
	A	*B*	*C*	*D*	*E*		
	Number of Fields Discovered in Year Indicated						
1938	0	10	21	55	131	226	17.7
1939	5	1	16	46	103	171	12.8
1940	3	8	20	56	149	336	9.2
1941	4	3	13	63	197	280	7.1
1942	1	3	10	53	195	262	5.3
1943	1	1	12	56	221	291	4.8
1944	3	1	4	62	198	268	3.0

* In these estimates of total ultimate reserves, made as of Jan. 1, 1946,
A means 50 million or more barrels
B means between 25 million and 50 million barrels
C means between 10 million and 25 million barrels
D means between 1 million and 10 million barrels
E means less than 1 million barrels.

There is no doubt that the percentages recorded for 1944 and probably for 1943 and 1942 will increase somewhat by future raising of some D estimates into the C group, but these changes will probably not be more than a point or two. As the years go by, we geologists should especially watch the trend from 1938 forward to the year 3 or 4 years previous to the year of writing each annual report of this committee.

We shall not attempt a summary, or any further conclusions than those mentioned or implied in the foregoing text. Our committee will welcome any suggestions for improvement of its annual reports in future years.

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DEVELOPMENTS IN CALIFORNIA IN 1945[1]

GRAHAM B. MOODY[2]

ABSTRACT

Four hundred and ten exploratory wells were completed during 1945 for a total exploratory distance of 1,772,920 feet or 336 miles. This set a new record for California and represented an increase of 95 wells and 335,419 feet over the 1944 accomplishment. The total number of completions, total footage, and percentage of success for the different types of exploratory wells were as follows: wildcats—269 wells, 1,215,610 feet, wells 9.7 per cent successful, footage 8.2 per cent successful; new pool tests—50 wells, 134,676 feet, wells 40 per cent successful, footage 30 per cent successful; outposts—91 wells, 422,634 feet, wells 44 per cent successful, footage 41 per cent successful. All exploratory wells were 21 per cent successful as to number and 17.5 per cent successful as to footage; the analogous figures for 1944 were 22.5 per cent in respect to both wells and footage. Thirty-eight oil pools and fields and eight gas pools and fields were discovered. Subsurface geology played a leading role in locating the discovery wells. New pools, new fields, and successful outpost wells added about 222,000,000 barrels to reserves, but none of the new pools or new fields could be rated as a major discovery. Production during 1945 was about 326,444,000 barrels of oil and 552,932,000 MCF of gas.

INTRODUCTION

The classification of exploratory wells described by F. H. Lahee[3] is used in this statistical study of California's exploratory wells completed in 1945. The majority of wells present no difficulty in their allocation to the proper type of hole. Numerous holes each year, however, partake of the attributes of two types and could be assigned to either with arguments in favor of both classifications. Differences of opinion usually are most pronounced on successful exploratory wells which are particularly important to the industry and merit careful consideration in their rating as field or pool discoveries or as noteworthy extensions of previously productive areas. Lahee's[4] graphic illustration of the types of holes is utilized in the classifying of our exploratory wells. The personal equation, however, obviously will have considerable influence in the classification of some wells.

It is difficult at times to ascertain the exact basis for locating an exploratory well. Some wells, for example, are located on the results of subsurface geological studies, aided by interpretation of regional seismic work, further modified by conceptions of regional trends, and influenced finally by lease obligations. Credit is given as far as possible to the types of investigation that were chiefly responsible for the selection of well locations.

A year ago[5] an explanation was given for the basis on which dry exploratory

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[3] F. H. Lahee, "Exploratory Drilling in 1944," this *Bulletin*, Vol. 29, No. 6 (1945), p. 630.

[4] F. H. Lahee, *op. cit.*, pp. 632–34.

[5] This *Bulletin*, Vol. 29, No. 6 (1945), p. 646.

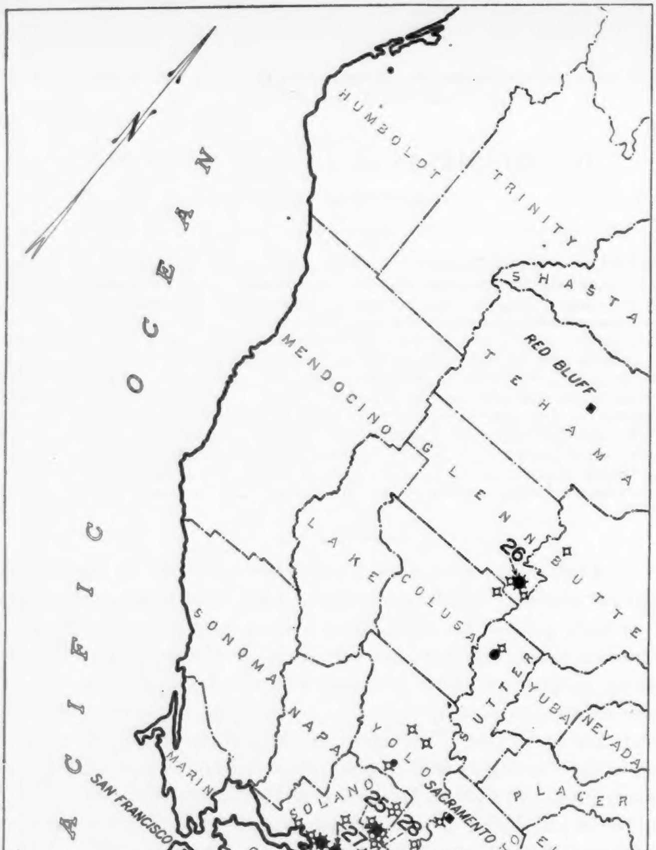


FIG. 1.—Location of 1945 exploratory wells (gas wells and failures) in northern California. Shaded areas are gas fields. Numbers designate wells listed in Table IV.

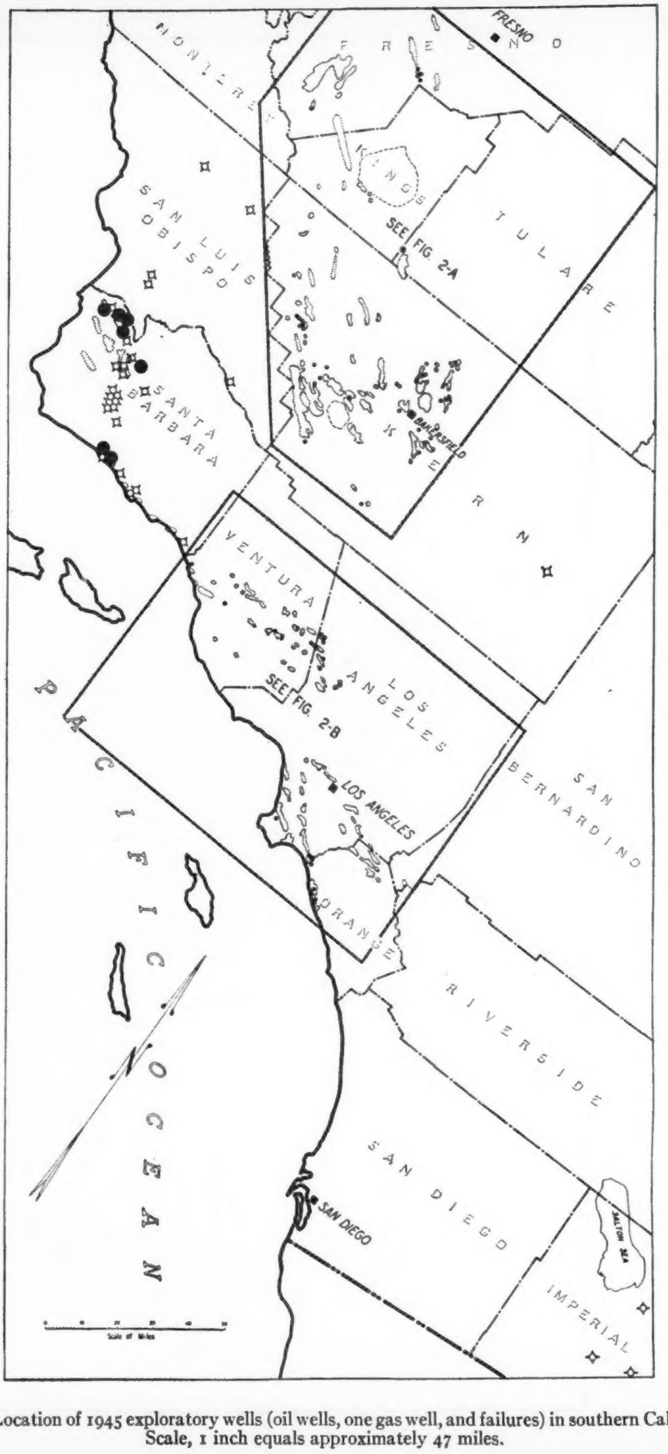
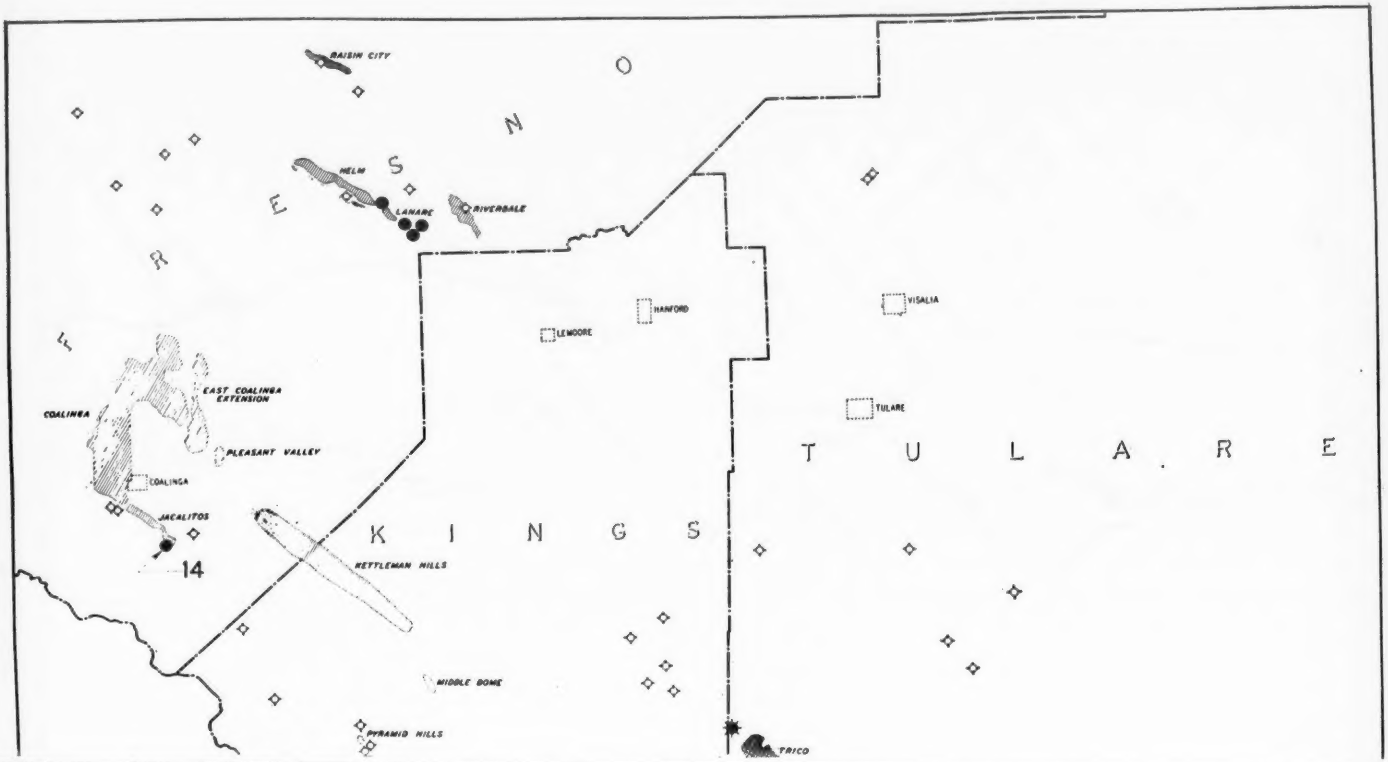
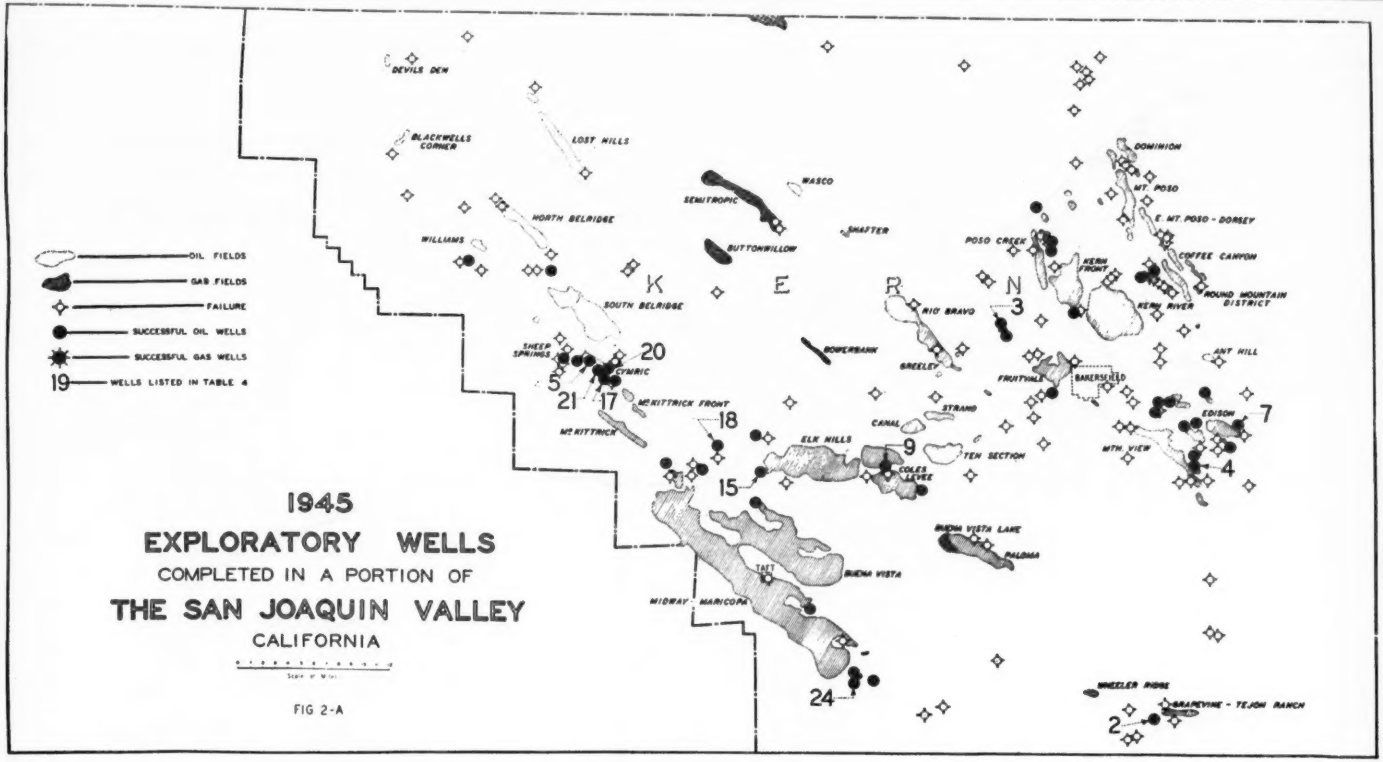


FIG. 2.—Location of 1945 exploratory wells (oil wells, one gas well, and failures) in southern California. Scale, 1 inch equals approximately 47 miles.



FRESNO
KINGS
TULARE
RAISIN CITY
HELM
LANARE
RIVERDALE
HANFORD
LEMOORE
VISALIA
TULARE
EAST COALINGA EXTENSION
COALINGA
PLEASANT VALLEY
COALINGA
JACALITOS
14
KETTLEMAN HILLS
MIDDLE DOME
PYRAMID HILLS
TRICO



OIL FIELDS
GAS FIELDS
FAILURE
SUCCESSFUL OIL WELLS
SUCCESSFUL GAS WELLS
19 WELLS LISTED IN TABLE 4
1945
EXPLORATORY WELLS
COMPLETED IN A PORTION OF
THE SAN JOAQUIN VALLEY
CALIFORNIA
FIG 2-A
KERN
DEVILS DEN
BLACKWELLS CORNER
LOST HILLS
NORTH BELRIDGE
WILLIAMS
SOUTH BELRIDGE
SHEEP SPRINGS
CYMRIC
McKITTRICK FRONT
McKITTRICK
SEMITROPIC
BUTTONWILLOW
WASCO
SHAFTER
POWERBANK
RIO BRAVO
GREELEY
POSO CREEK
KERN FRONT
KERN RIVER
DOMINION
MT. POSO
E. MT. POSO - DORSEY
COFFEE CANYON
ROUND MOUNTAIN DISTRICT
ANT HILL
FRUITVALE
BAKERSFIELD
EDISON
MTN. VIEW
STRAND
CANAL
TEN SECTION
ELK HILLS
COLES LEVEE
BUENA VISTA LAKE
PALOMA
BUENA VISTA
TAFT
MIDWAY - MARICOPA
WHEELER RIDGE
GRAPEVINE - TEJON RANCH
PYRAMID HILLS
TRICO
2
3
4
5
7
9
15
17
18
20
21
24

FIG. 2-A

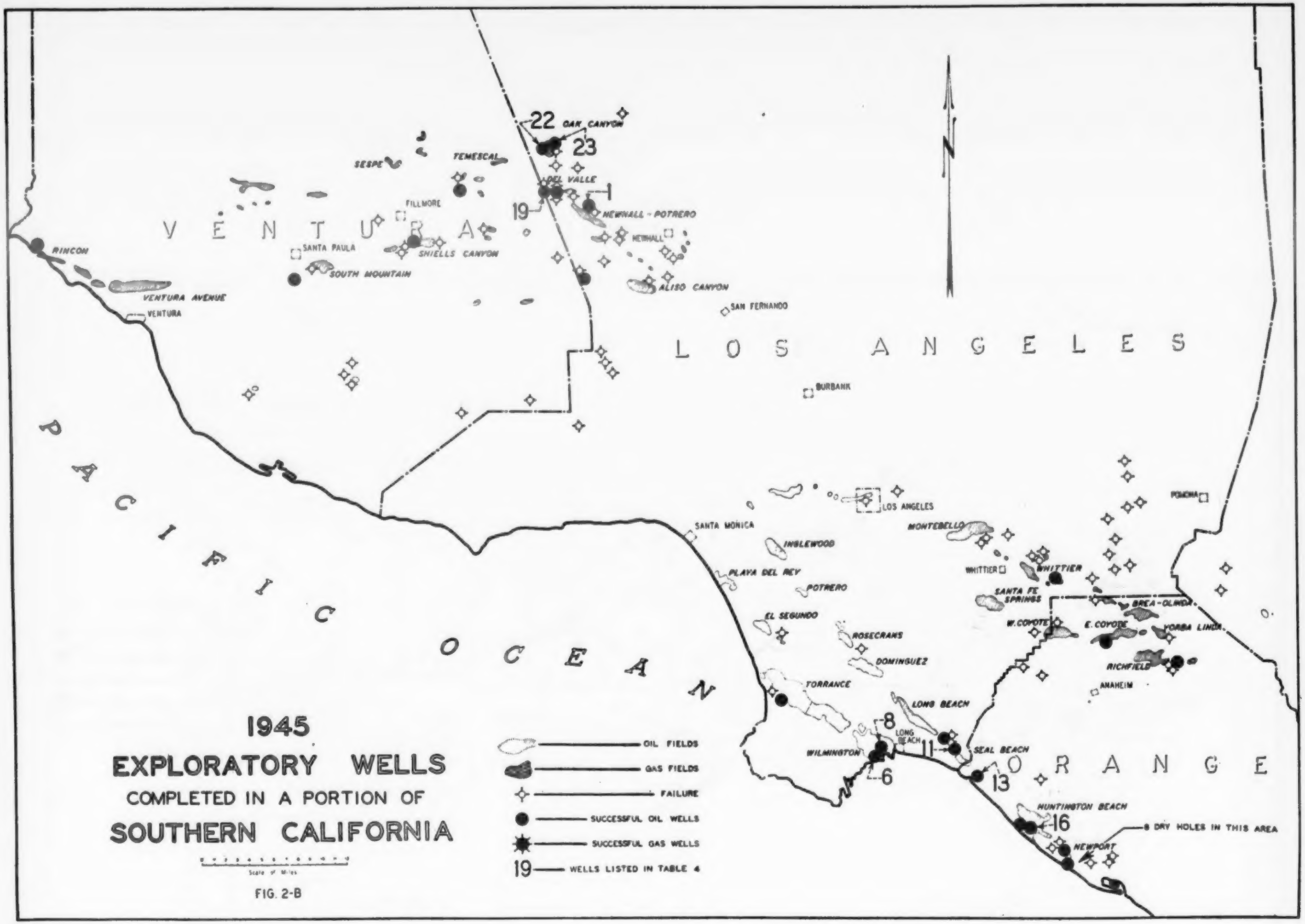

1945
EXPLORATORY WELLS
COMPLETED IN A PORTION OF
SOUTHERN CALIFORNIA
Scale of Miles
FIG. 2-B
OIL FIELDS
GAS FIELDS
FAILURE
SUCCESSFUL OIL WELLS
SUCCESSFUL GAS WELLS
19 WELLS LISTED IN TABLE 4
VENTURA
LOS ANGELES
ORANGE
PACIFIC OCEAN
N
RINCON
VENTURA AVENUE
VENTURA
SANTA PAULA
SOUTH MOUNTAIN
SHIELLS CANYON
FILLMORE
SESPE
TEMESCAL
OAK CANYON
DEL VALLE
NEWHALL - POTRERO
NEWHALL
ALISO CANYON
SAN FERNANDO
BURBANK
LOS ANGELES
SANTA MONICA
INGLEWOOD
PLAYA DEL REY
POTRERO
EL SEGUNDO
ROSECRANS
DOMINGUEZ
TORRANCE
WILMINGTON
LONG BEACH
SEAL BEACH
MONTEBELLO
WHITTIER
SANTA FE SPRINGS
W. COYOTE
E. COYOTE
BREA-OLINDA
YORBA LINDA
RICHFIELD
ANAHEIM
POMONA
HUNTINGTON BEACH
NEWPORT
8 DRY HOLES IN THIS AREA
22
23
19
1
8
6
11
13
16

FIG. 2-B

holes were classed either as oil-exploratory or gas-exploratory wells. The distinction between these two major types is significant in a consideration of the relative success obtained from exploratory drilling for oil and for gas.

EXPLORATION

GENERAL

The completion of 410 exploratory wells and 1,772,920 feet (336 miles) of exploratory hole in 1945 broke the previous high record of 315 exploratory completions and 1,437,501 feet of exploratory hole established in 1944. Successful exploratory completions increased from 71 in 1944 to 86 in 1945 but the success factor declined from 22.5 per cent in 1944 to 21 per cent in 1945. The average exploratory footage per well declined from 4,563 in 1944 to 4,324 in 1945. The 77 successful oil-exploratory wells had a rated initial production of 20,390 barrels daily and the 9 successful gas-exploratory wells a rated initial production of 56,274 MCF daily.

Geophysical activity dropped from 17 seismograph and 7 gravimeter parties operating at the end of 1944 to 14 seismograph parties and 1 gravimeter party at the end of 1945.

DISTRIBUTION OF EFFORT

The locations of exploratory completions are given on Figures 1, 2, 2-A, and 2-B. Oil and gas fields also are indicated by means of generalized outlines and enough of them are named to serve as points of orientation. Figure 1 covers the northern part of the state and carries all successful and dry exploratory wells. Figure 2 covers the southern part of the state but shows all successful and dry exploratory wells only in its less congested portions. Figures 2-A and 2-B are enlargements of those parts of Figure 2 wherein the exploratory wells were too closely spaced to show clearly on the latter. Numbers affixed to the successful wells are for reference to Table IV.

An examination of these maps indicates that the greatest concentration of exploratory drilling was in Kern County and Los Angeles County. Approximately 52 per cent of all oil-exploratory wells were completed in Kern County and another 18 per cent in Los Angeles County. The two counties enjoyed 70 per cent of all oil-exploratory and 57 per cent of total exploratory effort in the state last year.

SUCCESS OF EXPLORATORY EFFORT

Table I summarizes the number of wells, the footages, and the success percentages of the different types of exploratory holes. An inspection of this table emphasizes the previously recognized top-flight risk involved in drilling a new field wildcat. This type of hole was only 5 per cent successful whereas the other types were from 35 to 71 per cent successful. It is only fair to comment that the 71 per cent success factor for shallower pool tests represents such a small number of holes that it scarcely is comparable with the success factors of the other types.

New pool wildcats, deeper pool tests, and outposts scored excellent results last year on the basis of their success percentages. It is of interest to note that oil-exploratory wells as a whole hit pay more frequently than did gas-exploratory

TABLE I

SUMMARY

EXPLORATORY WELL COMPLETIONS BY ALL OPERATORS

CALIFORNIA—1945

	Number of Wells Completed			*Exploratory Footage*				
				Total Footage			*Average Per Well*	
					Successful Wells			
	All Wells	*Successful Wells*	*Success Percentage*	*All Wells*	(*a*) *Amount*	*Success Percentage*	*All Wells*	*Successful Wells*
New Field Wildcats								
Drilled primarily to find oil	203	8	4	867,297	29,312	3.4	4,272	3,664
Drilled primarily to find gas	39	4	10	199,138	15,137	7.5	5,106	3,784
Totals	242	12	5	1,066,435	(b) 44,449	4.2	4,407	3,704
New Pool Wildcats								
Drilled primarily to find oil	23	11	48	130,833	45,815	35	5,688	4,165
Drilled primarily to find gas	4	3	75	18,342	8,746	48	4,586	2,915
Totals	27	14	52	149,175	(c) 54,561	37	5,525	3,904
Shallower Pool Tests								
Drilled primarily to find oil	5	4	80	21,075	15,261	72	4,215	3,815
Drilled primarily to find gas	2	1	50	9,375	5,400	58	4,687	5,400
Totals	7	5	71	30,450	20,661	68	4,350	4,132
Deeper Pool Tests								
Drilled primarily to find oil	41	15	37	90,394	(e) 19,468	22	2,205	1,299
Drilled primarily to find gas	2	—	—	13,832	—	—	6,916	—
Totals	43	15	35	(f) 104,226	(e) 19,468	19	2,412	1,299
Outposts								
Drilled primarily to find oil	85	39	46	391,817	167,344	43	4,610	4,291
Drilled primarily to find gas	6	1	16.7	30,817	4,480	14.5	5,136	4,480
Totals	91	40	44	422,634	(d) 171,824	41	4,644	4,296
Totals—All Exploratory Wells								
Drilled primarily to find oil	357	77	21.6	1,501,416	277,200	18.5	4,206	3,648
Drilled primarily to find gas	53	9	17	271,504	33,763	12.5	5,123	3,751
Grand totals	410	86	21	1,772,920	(g) 310,963	17.5	4,324	3,659

(a) This is net discovery or net successful exploratory footage.
(b) Drilled an additional 7,084 feet of dry exploratory hole.
(c) Drilled an additional 1,601 feet of dry exploratory hole.
(d) Drilled an additional 14,285 feet of dry exploratory hole.
(e) Drilled an additional 10,112 feet of dry exploratory hole and 58,402 non-exploratory feet to pass depth of previously productive pools.
(f) All deeper pool tests drilled an additional 218,992 non-exploratory feet to pass depths of previously productive pools.
(g) All successful exploratory wells drilled an additional 33,082 feet of dry exploratory hole.

wells, 21.5 per cent success for the oil wells and 17 per cent success for the gas wells. All exploratory ventures were 21 per cent successful; the comparable figure in 1944 was 22.5 per cent.

The success factor for footage dropped from 22.5 per cent in 1944 to 17.5 per cent in 1945. This pronounced decrease was due to the change in relationship of

footage drilled in successful holes to that in failures. In 1944 the average exploratory footage was 5,046 and 4,423 in successes and failures, respectively, whereas, in 1945 the comparable figures were 4,000 and 4,410. Successful holes in 1944, therefore, had an average of 14 per cent more footage than did the failures but in 1945 had an average of 9 per cent less footage than that drilled by failures. One of the more interesting failures, Standard Oil Company's No. 20-13 KCL,[6] completed drilling in 1944 at a depth of 16,246 feet, but was not abandoned until 1945, and its record dry footage was credited, therefore, to the latter year.

Table II allocates exploratory wells to type of hole and to the basis for locating

TABLE II

EXPLORATORY WELLS ALLOCATED TO TYPE OF WELL AND TO BASIS FOR LOCATING WELL

	New Field and New Pool Wildcats			*Deeper and Shallower Pool Tests*			*Outposts*			*Totals*		
	Total Wells	*Successful Wells*		*Total Wells*	*Successful Wells*		*Total Wells*	*Successful Wells*		*Total Wells*	*Successful Wells*	
		Number	*% of Total*		*Number*	*% of Total*		*Number*	*% of Total*		*Number*	*% of Total*
Surface geology	66	4	6	1	—	—	7	—	—	74	4	5.4
Surface geology and trend	2	1	50	—	—	—	—	—	—	2	1	50
Surface geology and seismic	1	—	—	—	—	—	—	—	—	1	—	—
Surface and subsurface geology and seismic	2	—	—	—	—	—	—	—	—	2	—	—
Surface and subsurface geology	22	4	18	2	1	50	4	1	25	28	6	21
Subsurface geology	56	11	20	43	18	42	32	17	53	131	46	35
Subsurface geology and trend	4	1	25	1	—	—	11	11	100	16	12	75
Subsurface geology and seismic	25	4	16	3	1	33	14	6	43	42	11	26
Seismic	39	1	2.6	—	—	—	2	—	—	41	1	2.4
Trend	8	—	—	—	—	—	8	4	50	16	4	25
Non-technical	44	—	—	—	—	—	13	1	7.7	57	1	1.8
Totals	269	26	9.7	50	20	40	91	40	44	410	86	21

the well. For the purposes of this study the wildcat wells (new field and new pool) are combined. New pool tests (shallower and deeper) are also combined. These two combinations permit a direct comparison of all wildcats with all new pool tests in old fields and with outposts. Table III treats exploratory footage on a similar basis to that used for wells in Table II.

A glance at these two tables shows that subsurface geology played the dominant role in exploratory effort last year. It was entirely responsible for the locating of 32 per cent of all exploratory holes (131 out of 410) and for the drilling of 26 per cent of all exploratory footage (463,618 feet out of 1,772,920 feet). It was 35 and 31 per cent successful as to number of wells and to exploratory footage, respectively. This is considerably above the average success achieved by all exploratory methods, that is, 21 per cent for wells and 17.5 per cent for footage. Subsurface geology, furthermore, was involved with surface geology, seismic work, and trend in the locating of 88 more wells and the drilling of an

[6] Discussed a year ago, this *Bulletin*, Vol. 29, No. 6 (1945), p. 652.

TABLE III

EXPLORATORY FOOTAGE ALLOCATED TO TYPE OF WELL AND TO BASIS FOR LOCATING WELL

	New Field and New Pool Wildcats			*Deeper and Shallower Pool Tests*			*Outposts*			*Total*		
	Total Footage	*Successful Footage*		*Total Footage*	*Successful Footage*		*Total Footage*	*Successful Footage*		*Total Footage*	*Successful Footage*	
		Amount	*% of Total*		*Amount*	*% of Total*		*Amount*	*% of Total*		*Amount*	*% of Total*
Surface geology	241,974	9,369	3.9	7,588	—	—	35,280	—	—	284,842	9,369	3.3
Surface geology and trend	7,793	5,452	70	—	—	—	—	—	—	7,793	5,452	70
Surface geology and seismic	10,549	—	—	—	—	—	—	—	—	10,549	—	—
Surface and subsurface geology and seismic	13,560	—	—	—	—	—	—	—	—	13,560	—	—
Surface and subsurface geology	104,789	11,632	11	8,123	2,022	25	23,500	619	2.6	136,412	14,273	10.5
Subsurface geology	234,483	46,406	20	99,384	33,942	34	129,751	62,316	48	463,618	142,664	31
Subsurface geology and trend	23,605	5,726	24	1,584	—	—	56,669	54,612	96	81,858	60,338	74
Subsurface geology and seismic	163,096	15,636	9.6	17,997	4,165	23	105,962	38,089	36	287,055	57,890	20
Seismic	241,627	4,789	2	—	—	—	9,564	—	—	251,191	4,789	1.9
Trend	29,657	—	—	—	—	—	24,076	11,193	46	53,733	11,193	21
Non-technical	144,477	—	—	—	—	—	37,832	4,995	13	182,309	4,995	2.7
Totals	1,215,610	99,010	8.1	134,676	40,129	30	422,634	171,824	41	1,772,920	310,963	17.5

additional 518,885 feet of exploratory hole. Subsurface geology, therefore, was influential in the locating of 219 wells, 53 per cent of all exploratory holes, and the drilling of 982,503 feet of exploratory hole, 55 per cent of the total footage. Its success factors for all ventures in which it participated were 34 per cent of wells drilled and 28 per cent of exploratory hole made.

Holes located on the non-technical basis scored only one success in 57 tries. This indicates that the finding of new oil in California requires more than a "hunch" in the selection of exploratory well locations.

DISCOVERIES

Table IV presents statistical data on the important discoveries made during 1945. The numbers in the first column correspond to well numbers on the maps. It will be noted that the majority of important discoveries are new pools. Some of the discoveries merit comments in addition to the statistical data in Table IV.

Barnsdall Oil Company completed its R.S.F. well No. 44 in March to open production in the 6th zone in the Newhall-Potrero field. Previous production in this field had been from zones 1, 2, and 3. The discovery well, sole completion in the 6th zone, produced 118,880 barrels by the end of the year and made an average of 350 barrels daily during December. A substantial addition to the field's reserves may be expected from the 6th zone. The discovery well, furthermore, indicated the possibility of production from the 5th zone and from other sands below the 6th zone.

The Rosedale Ranch field was discovered in March by the General Petroleum Corporation's Kernway 44-1. The discovery well produced from the Miocene. Five months later the General Petroleum completed Kernway 75-1 as the discovery well of Pliocene production in the field. There were 4 wells producing 169 barrels daily in December. The proved productive area was approximately 200 acres. The performance of this field does not indicate that it is a major discovery. Total production for the year was 32,961 barrels.

Several new pools were discovered in the old Cymric field. The Union Oil Company led the discovery parade in this field by completion on September 13 of its Anderson 45-26 well in a sand considered generally to be an upper finger in the Carneros. This zone is known as the Anderson 45 pool. The Standard Oil Company scored the second hit, on September 18, by completion of Weston 44-26 in a second sand zone in the Carneros, separated from the Anderson 45 sand by a considerable thickness of shale. This is named the Weston pool. The third hit was made by the Independent Exploration Company when it completed Oceanic No. 1 for nearly a thousand barrels a day in Kreyenhagen sand. This is known as the Oceanic pool, but has been called by some the Brunt pool. The Union Oil Company completed the list of important discoveries in Cymric for the year by discovery on December 18 of basal Etchegoin production in its Anderson 54 well. This is the Anderson 54 pool. These four new pools added con-

TABLE IV

IMPORTANT 1945 DISCOVERIES IN CALIFORNIA: NEW FIELDS AND NEW POOLS

	Operator	Discovery Well	County	Location S-T-R	Compl. Date	Total Depth (Feet)	Net Discovery Footage	Initial Production Oil B/D	Initial Production Gas MCF/D	Name of Producing Formation	Name of New Field or New Pool Discovered	Method of Locating Discovery Well
	WELLS DRILLED PRIMARILY TO FIND OIL											
1.	Barnsdall Oil	R.S.F. 44	Los Angeles	26-4N-17W	3/29	11,229	3,053	530	590	Modelo	6th Zone-Newhall-Potrero	Subsurface
2.	British-Amer. Oil	Tejon 41-5	Kern	5-10N-19W	12/22	2,660	2,660	524		Chanac	Chanac-S.W. Grapevine	"
3.	General Pet.	Kernway 44-1	"	1-29S-26E	3/31	5,050	4,877	150		Sta. Margarita	Rosedale Ranch	Subsurface and seismic
4.	Gilmour, L. S.	Kirk 1	"	6-30S-29E	12/19	4,618	4,618	223		Up. Miocene	Wicker Sd.-N.W. Edison	Subsurface
5.	Independent Expl.	Oceanic 1	"	22-29S-21E	10/25	4,700	4,699	956	500	Kreyenhagen	Oceanic Sd.-Cymric	"
6.	Long Beach Oil Dev.	W-97	Los Angeles	3-5S-13E	10/3	6,228	228	415		Miocene	Schist Congl.-Wilmington	"
7.	Magee, H. H.	Brockman 3	Kern	13-30S-29E	6/29	2,300	2,300	525		Pre-Jurassic	Fract. Schist-Edison	"
8.	Richfield Oil	Pacific Dook 34	Los Angeles	3-5S-13W	3/26	6,932	223	568		Puente	Ford in F. B. IV-Wilmington	"
9.	" "	CL-A 1-G-33	Kern	33-30S-25E	7/8	5,400	5,400		5,000	Etchegoin	Etchegoin-N. Coles Levee	"
10.	Shell Oil Co.	Covarrubias 1-35	Sta. Barbara	32-5N-30W	2/10	4,024	906	1,374	695	Sespe	Covarrubias-35-Capitan	"
11.	" " "	Bryant 2-1	Los Angeles	3-5S-12W	2/21	9,744	9,630	455	290	Miocene	Lower McGrath-Seal Beach	"
12.	" " "	Covarrubias 1-36	Sta. Barbara	32-5N-30W	8/8	6,984	1,126	521	650	Coldwater	Coldwater-Capitan	"
13.	Standard Oil Co.	San Gabriel-Al. 2	Los Angeles	3-5S-12W	2/24	6,565	4,508	248	1,800	Repetto	San Gabriel-Seal Beach	"
14.	" " "	72-35E	Fresno	35-21S-15E	3/4	5,210	560	1,182	500	Temblor	72-35E-Jacalitos	"
15.	" " "	U.O.N.P.R. No. 1 Well 82-2B	Kern	2-31S-23E	4/28	2,936	236	338		Pliocene	Super-Bittium-Elk Hills	"
16.	" " "	Huntington A-77	Orange	3-6S-11W	7/19	5,113	1,425	240	875	Puente	A-66-Huntington Beach	"
17.	" " "	Weston 44-26	Kern	26-29S-21E	9/18	3,672	37	252	162	Carneros	Weston-Cymric	"
18.	" " "	U.O.N.P.R. No. 1 Well 342-29R	"	29-30S-23E	12/29	5,726	5,726	Shut in		Up. Miocene	Hillcrest-Elk Hills	"
19.	Texas Company	Kern 42-18	Los Angeles	18-4N-17W	4/18	3,114	3,004	196		Modelo	Ramona Pool-Del Valle	Surface and subsurface
20.	Union Oil	Anderson 45-26	Kern	26-29S-21E	9/13	3,610	2,499	1,094	809	Carneros	Anderson 45-Cymric	Subsurface
21.	" "	Anderson 54	"	26-29S-21E	12/18	4,070	3,615	300		Basal Etch.	Anderson 54-Cymric	"
22.	Western Gulf	G. R. Wickham 1-A	Los Angeles	31-5N-17W	1/10	7,023	1,540	200		Modelo	4AB-Oak Canyon	"
23.	" "	L. W. Gilmour U.S.L. 3	" "	32-5N-17W	2/24	10,816	2,360	185		"	8AB-Oak Canyon	"
24.	" "	Woodward U.S.L. 2	Kern	21-11N-23W	8/1	2,678	2,022	1,200	192	Up. Miocene	Santiago-Maricopa	Surface and subsurface
	WELLS DRILLED PRIMARILY TO FIND GAS											
25.	Amerada Pet. Corp.	Wineman 1	Solano	26-6N-2E	3/1	5,000	4,789		18,997	Eocene	Maine Prairie	Seismic
26.	Richfield Oil	Afton Comm. 2-1	Glenn	34-19N-1W	5/3	2,785	2,731		4,300	Cretaceous	Afton	Subsurface and seismic
27.	Shell Oil	Lambie 1-A	Solano	30-4N-1E	1/10	2,320	2,320		3,980	Domengine	Kirby Hill	Surface
28.	Standard Oil	Cal-Packing 2	"	6-4N-3E	3/1	4,840	4,790		14,867	Meganos	Cache Slough	Subsurface and seismic

siderable amounts to the reserves of Cymric and stimulated the search for new oil in that area.

Production from schist conglomerate immediately overlying the basement in Wilmington was discovered in October by the Long Beach Oil and Development Company's well W-97. This is an important discovery and will lead to the drilling of new wells and the deepening of old wells to this pool. It will be remembered that the discovery well of Wilmington was drilled to the basement, which was barren at that location, and was plugged back to produce from the Terminal zone.

H. H. Magee completed Brockman 3 in June as the discovery well of production from fractured basement in the Edison field. This is one of the outstanding discoveries of 1945 and added substantial quantities to the proved reserves of Edison. About 900 acres had been proved productive by the end of the year. There were 20 producers in December. The pool produced an average of 6,930 barrels daily in December and a total of 688,236 barrels during the year. It is said that the first production from fractured schist in Edison was in 1933, but it was not recorded as such and no attempt was made to exploit it until Brockman 3 was completed last year.

The Shell Oil Company found two new pools in the Capitan field. The Covarrubias-35 pool was in the Sespe, but below any earlier Sespe production, and the Coldwater pool was in the Eocene. The latter pool is of importance mainly because it is in a formation not previously productive in the area. The Covarrubias-35 pool produced a total of 126,852 barrels during the year and 1,457 barrels daily during December, whereas the Coldwater pool produced a total of 16,432 barrels in 1945 and 157 barrels daily in December. There were 10 producers in the former pool in December but only one in the latter.

The Standard Oil Company of California opened production in February from the San Gabriel zone (Repetto) in Seal Beach by completion of its San Gabriel-Alamitos 2. This new production lies north of the main fault. The area proved for production in this pool probably will be small. The only well completed in this pool produced 51,009 barrels in 1945 and 163 barrels daily in December.

The same company's well 72-35E in Jacalitos opened the lower Temblor to production in March in the southeast part of the field. The productive area of this pool is limited on the west by a fault and probably will not be large. The one well in this pool produced about 214 barrels daily in December and a total of about 65,900 barrels during the year.

The Texas Company's Kern 42-18 in April opened a new area to production west of Del Valle. This discovery is called the Ramona field by some and the Ramona pool in the Del Valle field by other authorities. The pool produced 466 barrels daily in December and a total of 78,811 barrels during the year. Developments to the end of the year indicated that the productive area would be small and that the additions to reserves would not be large. There were 5 producers at the close of 1945.

TABLE V

County, Farm and Well Number	Operator	Section Township Range	Date of Compl. 1945	Completion Data: Oil(L) Gas(S)	Total Drilled Depth of Hole (Feet)	Total Compl. (Producing) Depth of Hole (Feet)	Age of Producing Formation	Name of Extended (or Newly Discovered) Pool
1945 SUCCESSFUL NEW-POOL WILDCATS								
Glen								
Afton Comm. 2-1	Richfield Oil Co.	34-19N-1W	5/3	S	2,785	2,731	Cretaceous	New zone in Afton field
Kern								
Tejon 41-5	British American	5-10N-19W	12/22	L	2,660	2,660	Upper Mio.	Chanac-SW. Grapevine
Derby 23	Getty, J. P.	33-30S-29E	8/16	L	6,951	5,510	Upper Mio.	Transition zone-E.Mt. View
Kirk 1	Gilmour, L. S.	6-30S-29E	12/19	L	4,618	4,618	Upper Mio.	Wicker sand-N.W. Edison
Oceanic 1	Independent Explor.	22-29S-21E	10/25	L	4,700	5,699	Oligocene	Oceanic sand-Cymric field
Cymric 1	Independent Explor.	21-29S-21E	12/3	L	4,541	2,864	Etchegoin	Calitoleum-Cymric field
Brockman 3	Magee, H. H.	13-30S-29E	6/29	L	2,300	2,300	Pre-Jurassic	Fract. schist-Edison field
Anderson 2	Rothschild-Bender	20-29S-21E	1/25	L	3,054	3,054	Lower Mio.	Carneros-S. Sheep Springs
62-33D	Standard Oil Co.	33-32S-24E	8/22	L	2,970*	2,968*	Middle Plio.	33-D pool-Midway-Sunset
Los Angeles								
Bryant 2-1	Shell Oil Co.	3-5S-12W	2/21	L	9,744*	9,630*	Miocene	Lower McGrath-Seal Beach
San Gabriel-Al. 2	Standard Oil Co.	13-5S-12W	2/24	L	6,565	4,508	Pliocene	San Gabriel-Seal Beach
Kern 42-18	Texas Co.	18-4N-17W	4/18	L	3,114*	3,004*	Upper Mio.	Ramona pool-W. Del Valle
Solano								
Lambie 2	Shell Oil Co.	30-4N-1E	3/6	S	3,228	3,138	Eocene	Basal Martinez-Kirby Hill
Lambie 3	Shell Oil Co.	25-4N-1W	5/15	S	4,385	2,877	Eocene	Up. Martinez-Kirby Hill
				L	51,247	45,815		
				S	10,398	8,746		
Totals					61,645	54,561		

* Completed as extensions of old producing zones.

TABLE V—(*continued*)

			1945 SUCCESSFUL NEW-FIELD WILDCATS					
Kern								
Kernway 44-1	General Petrol.	1-29S-26E	3/21	L	5,050	4,877	Upper Mio.	Rosedale Ranch
UPONPR No. 1 Well 342-29R	Standard Oil Co.	29-30S-23W	12/30	L	5,726	5,726	Upper Mio.	Hillcrest
Layman 1	Williams Bros.	12-28S-19E	7/23	L	853	853	Eocene	McDonald anticline
Los Angeles								
Simi 5	Union Oil Co.	22-3N-17W	8/17	L	1,034	1,034	Eocene	Las Llajas
Orange								
Sansinena 15	Union Oil Co.	30-2S-10W	5/25	L	3,595	3,595	Pliocene	Sansinena
Santa Barbara								
Wickenden 1	Four-Five-Six Oil	34-9N-32W	1/10	L	4,606	4,606	Miocene	Tinaquaic
Solano								
Wineman 1	Amerada Pet. Corp.	26-6N-2E	3/1	S	5,000	4,789	Eocene	Maine Prairie
Lambie 1A	Shell Oil	30-4N-1E	1/10	S	2,320	2,320	Eocene	Kirby Hills
Cal-Packing 2	Standard Oil Co.	6-4N-3E	3/1	S	4,840	4,790	Eocene	Cache Slough
Tulare								
Atwell Is. 1	Trico & Standard Oil	7-24S-23E	10/14	S	4,206	3,238	Upper Plio.	Atwell Island
Ventura								
L.B.H. 1	Los Nietos	22-3N-21W	2/18	L	5,651	5,452	Sespe	West Mountain
Aguirre 1	Universal Cons. & Adams	13-4N-18W	12/10	L	3,169	3,169	Miocene	Holser Canyon area
				L	29,684	29,312		
				S	16,366	15,137		
Totals					46,050	44,449		

TABLE VI

County, Farm and Well Number	Operator	Section Township Range	Date of Compl. 1945	Oil (L) Gas (S)	Total Completion (Producing) Depth in Pool Previously Developed (Feet)	Total Drilled Depth of Hole (Feet)	Total Compl. (Producing) Depth of Hole (Feet)	Age of Producing Formation	Name of Field and Name of Newly Discovered Pool
				1945 SUCCESSFUL SHALLOWER-POOL TESTS					
Kern									
No. 35-6	Bankline Oil Co.	35-28S-27E	11/ 7	L	2,050	1,831	1,831	Pliocene	Kern River Form.-Kern Front
Kernway 75-1	General Petrol.	1-29S-26E	8/11	L	4,877	4,165	4,165	Lower Plio.	Rosedale Ranch
1-G-33 C.L.-A.	Richfield Oil Co.	33-30S-25E	7/ 8	S	9,621	5,400	5,400	Pliocene	Etchegoin-N. Coles Levee
Anderson 54	Union Oil Co.	26-29S-21E	12/18	L	3,800	3,615	3,615	Pliocene	Anderson 54-Cymric
Los Angeles									
Vasquez 13	Ohio Oil Co.	17-4N-17W	6/15	L	6,142	5,650	5,650	Pliocene-Mio.	Vasquez 13 zone-Del Valle
				L	16,869	15,261	15,251		
				S	9,621	5,400	5,400		
Totals					26,490	20,661	20,661		
				1945 SUCCESSFUL DEEPER-POOL TESTS					
Fresno									
No. 72-35E	Standard Oil Co.	35-21S-15E	3/ 4	L	4,608	5,210	5,168	Temblor	72-35E-Jacalitos
Kern									
UONPR #1 Well 82-2B	Standard Oil Co.	2-31S-23E	4/28	L	2,700	2,936	2,936	Pliocene	"AB" sand-Elk Hills
Weston 44-26	Standard Oil Co.	26-29S-21E	9/18	L	3,612	3,672	3,649	Lower Mio.	Weston sand-Cymric
Anderson 45-26	Union Oil Co.	26-29S-21E	7/13	L	1,107	3,610	3,606	Lower Mio.	Anderson 45 Sd.-Cymric
Woodward U.S.L. 2	Western Gulf Oil Co.	21-11N-23W	8/ 1	L	650	2,678	2,672	Upper Mio.	Maricopa-Santiago
Los Angeles									
R.S.F. 44	Barnsdall Oil Co.	26-4N-17W	3/29	L	6,787	11,229	9,840	Miocene	6th zone-Newhall-Potrero
W-97	Long Beach Dev.	3-5S-13W	10/ 3	L	6,000	6,228	6,228	Miocene	Schist conglom.-Wilmington
Pacific Dock 34	Richfield Oil Co.	3-5N-13W	3/26	L	5,600	6,952	5,823	Pliocene	F. B. IV-Ford-Wilmington
G. R. Wickham 1A	Western Gulf Oil Co.	31-5N-17W	1/10	L	5,430	7,023	6,970	Miocene	4-AB pool-Oak Canyon
L. W. Gilmour 3 U.S.L.	Western Gulf Oil Co.	32-5N-17W	2/24	L	7,400	10,816	9,760	Miocene	8-AB pool-Oak Canyon
Orange									
Huntington A-77	Standard Oil Co.	3-6S-11W	7/19	L	3,605	5,113	5,030	Pliocene	A-66 zone-Huntington Beach
Hualde 7	Tide Water Assoc.	23-3S-10W	8/ 6	L	3,607	7,962	5,113	Miocene	Breen zone-East Coyote
Santa Barbara									
Covarrubias 1-35	Shell Oil Co.	32-5N-30W	2/10	L	2,734	4,024	3,640	Sespe	Covarrubias-35-Capitan
Covarrubias 1-36	Shell Oil Co.	32-5N-30W	8/ 8	L	2,734	6,984	3,860	Eocene	Coldwater-Capitan
Ventura									
Signal 7	Dodge, Inc.	13-4N-19W	2/ 6	L	1,828	3,575	3,575	Miocene	Hopper Canyon
				L	58,402	88,012	77,870		
				S	—	—	—		
Totals					58,402	88,012	77,870		

The Western Gulf Oil Company discovered two new productive zones in Oak Canyon field, known as the 4-AB and 8-AB zones, in January and February, respectively. This operator has designated present producing zones and possible future productive zones by numbers and letters on the electric log of a deep hole in the field. Each new zone that is brought into production is named automatically in accordance with its position on the control log. This system saves time and controversy in naming new pools. Zones 4-AB and 8-AB had only the discovery wells producing at the end of the year. Production from the two zones was 237 barrels daily in December and 102,929 barrels for the year.

The Western Gulf Oil Company opened an important area of new production by completion in August of its Woodward USL 2 for an initial production of 1,200 barrels daily from the Miocene. This discovery is called Santiago and is classified in this study as a successful deeper pool test, but has been rated by other observers as a new field discovery. It was drilled on the Pioneer anticline in the old Western Minerals area which produced from the Pliocene long ago but has not produced in recent years. Interest was revived in the area when the Western Gulf Company completed Woodward USL 1 at 619 feet in the Pliocene, plugged back from total depth 2,729 feet, as a sub-commercial producer. Two months later the same operator made the Miocene discovery in its well No. 2. Finding production in the steeply dipping Miocene below the unconformity at the base of the Pliocene was a nice bit of exploratory work. The five wells in the Santiago pool produced 1,267 barrels daily in December and a total of 126,909 barrels during the year.

Another of the wells listed should be mentioned. The completion of UONPR No. 1 well 342-29R in the Stevens zone may be proved to be an important discovery. It is in the old Hillcrest area on the westerly part of the Reserve and is approximately 5 miles westerly from previously proved Stevens zone production. The intervening structural conditions have not been determined as yet. For the purposes of this report, therefore, the area has been classified tentatively as a new field.

Tables V and VI are added in order to give a complete listing of all exploratory wells that opened new fields or new pools to production in 1945. Table V covers the discoveries scored by new pool wildcats and new field wildcats. Table VI lists all new pool discoveries, both shallower and deeper, in old fields. Two of the new fields, Las Llajas and Holser Canyon, were subcommercial. The discovery well of Tinaquaic field had a reported initial production of around 500 barrels daily of 7° gravity oil in January. Costs of producing this oil were so high that the well finally was abandoned in December as a non-commercial venture.

EXTENSIONS

Pools and fields that had noteworthy extensions during the year are listed here by districts.

San Joaquin Valley.—South Belridge, 27-B pool in Buena Vista Hills, 21-1

pool in North Coles Levee, Mica sand pool in Cymric, Duff sand in Edison, upper zones in Elk Hills, Jacalitos, Lanare, Paloma, and Race Track.

Coastal District.—Miley pool in Rincon, Santa Maria Valley, South Mountain, and deep zones in Ventura Avenue.

Los Angeles Basin.—Main zone offshore in Huntington Beach, lower McGrath zone in Seal Beach, Main Zone in Torrance, West Newport, and zones in various fault blocks in Wilmington.

FAILURES

Exploratory failures number 324 and dry exploratory distance reached the impressive total of 1,461,957 feet or 277 miles. Twenty-eight of the dry exploratory holes penetrated the entire sedimentary section and finished in basement rocks.

Two hundred and seventy-seven miles is a long way to drill without finding a pot of petroleum (or gas) at the end of the journey. It merits comment, however, that a considerable number of dry exploratory holes may be raised above the level of complete failures for the reason that they discovered new subsurface information that indicates the possibility of production not far from their locations. The results of future exploratory holes, located on the basis of the findings in the dry holes, must be awaited before the value of the 1945 holes that failed can be assessed properly.

ADDITIONS TO RESERVES

New fields and new pools added approximately 63 million barrels and extensions added about 159 million barrels to the reserves of the state. Total new oil found by both discoveries and extensions, therefore, amounted to 222 million barrels. This represents about 68 per cent of the production during 1945.

Developments to the end of the year indicated that none of the new pools or fields could be rated as a major discovery. Many of the reserves estimated for new discoveries at the end of the year of discovery are ultra-conservative when viewed in the light of data available 2 or 3 years later. The ultimate recoveries of the discoveries in California during the years 1938 to 1942, inclusive, as estimated on January 1, 1945, were more than three times greater than the original estimates made at the end of the discovery years. It is hoped that comparable increases will be necessary in the estimates made for some of the 1945 discoveries.

DEVELOPMENTS

California contributed its share to the war effort by completion of 1,690 producing oil wells during the year, an increase of 27 completions over 1944. The 1945 completions had a rated initial production of 379,064 barrels daily or an average of 224 barrels daily per well completed. Comparable figures for 1944 were: 1,663 oil wells completed, 346,235 barrels daily rated initial production, and an average of 208 barrels daily per well. The above figures include new discovery, outpost, and development wells.

There were 56 producing wells completed in dry gas pools in 1945. This is 8 more than were completed in 1944. Rio Vista completed 32 producing wells, 18 of them in the Hamilton sand.

Development activity embraced almost every oil field in the state but was particularly pronounced in some of them. Twelve active fields are listed here.

Field	*Number of Producing Wells Completed*	*Rated Initial Production Barrels Daily*	
		Total	*Per Well Average*
Elk Hills	213	61,092	287
Wilmington	148	24,093	163
Buena Vista Hills	140	52,481	375
South Belridge	111	3,785	34
Santa Maria Valley	77	13,956	181
East Coalinga	57	6,331	111
Edison	51	25,021	491
Ventura Avenue	50	30,525	611
West Newport	49	4,887	100
Torrance	47	2,226	47
Huntington Beach	46	7,388	161
West Coyote	23	6,441	280

Total oil production reached a new high of 326,444,000 barrels. This was a daily average throughout the year of 894,367 barrels and represented an increase of 42,473 barrels daily over the similar figure for 1944. The peak of average daily production for an entire month was attained in May when it reached 942,154 barrels but a peak daily average for one week of 951,700 barrels was sustained during the week ending July 21. Production had been reduced to 841,604 barrels daily during December, which was 43,630 barrels less than the average in the like month of 1944.

The activity in Elk Hills was due to continued intensive development of the shallow zones in U.O.N.P.R. No. 1 in an endeavor to meet Pacific war demands. The proved productive area was enlarged. Production from the field was 42,139 barrels in December, 1944, increased to a maximum average of 64,983 barrels daily in July, 1945, but had been reduced to only 14,320 barrels daily in December, 1945. The cut-back in Elk Hills production started in August, 1945, following V-J day.

It will be recalled that the discovery of the 27-B pool in Buena Vista Hills was designated as the most important 1944 discovery in California. The 1945 developments of this pool support that conclusion. The proved area was increased greatly during the year and on January 1, 1946, was considered to be over 4,000 acres. The production during the year was approximately 10,861,000 barrels and during December was about 26,210 barrels daily. Its total production since discovery in March, 1944, to the end of 1945 was over 12 million barrels. There were 120 producers completed during the year, bringing the total number to 166.

TRENDS

Trends from 1940 to 1945, inclusive, in the amount and the success of exploratory drilling, are shown graphically in Figure 3. The reserves added annually

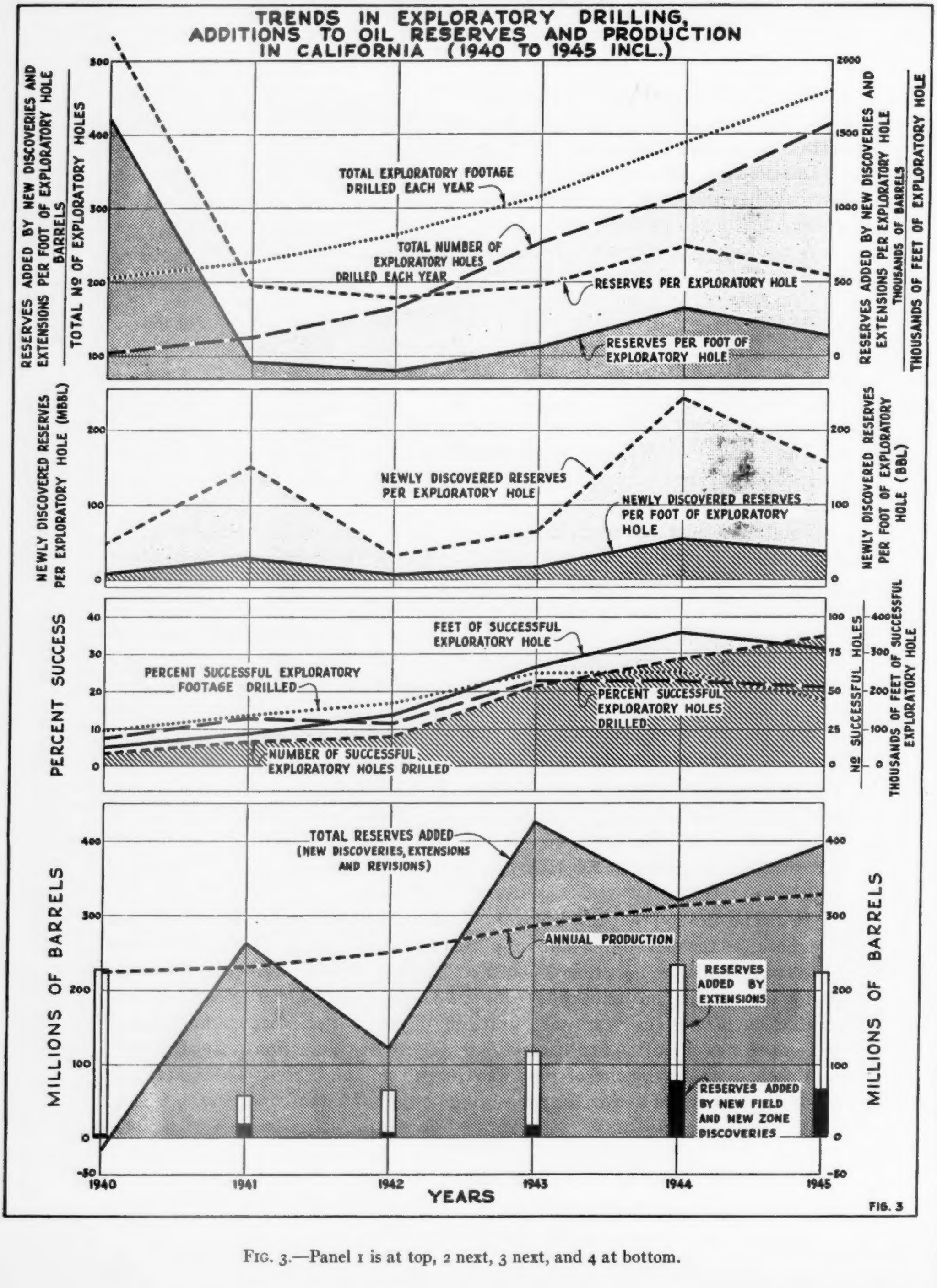


FIG. 3.—Panel 1 is at top, 2 next, 3 next, and 4 at bottom.

by new discoveries, extensions to old fields, and revisions to prior figures are based on estimates made by the American Petroleum Institute. The exploratory footage and the numbers of wells for the years 1940 to 1944, inclusive, are from F. H. Lahee,[7] but for 1945 are those given elsewhere in this article.

It should be noted again that the estimates of reserves made at the end of the discovery year for new pools and new fields usually are conservative. Subsequent additions to the original estimates will appear in reserves tabulations of later years either as extensions to old fields or as revisions to earlier estimates but do not show in the records as newly discovered reserves.

Panel 1 of Figure 3[8] presents the amount of exploratory footage and number of exploratory holes completed, and the new reserves added for each foot of hole and for each well. Note that the new reserves include those from discoveries, that is, new pools and new fields, and also those from extensions.

Panel 2 shows additions to reserves through new discoveries only, that is, new pools and new fields, for each foot of hole and for each well.

Panel 3 gives the amount of successful exploratory footage, the number of successful holes and the success factors for each.

Panel 4 presents the additions to reserves due to new discoveries, those due to extensions, and the total amounts added by new discoveries and extensions plus revisions to previous estimates. Annual production appears also in this panel for direct comparison with additions to reserves.

An examination of the four panels in Figure 3 shows that total exploratory footage, total number of exploratory holes, number of successful holes, and annual production have increased each successive year during the period covered. The trends of success percentages and of reserves added for each foot of exploratory hole and for each exploratory hole are not as constant throughout the period. It is to be noted, however, that the results of exploration in 1945 and in 1944 were more satisfactory in most aspects than those in the four previous years. The outstanding exception to this condition was the addition to reserves by means of extensions in 1940 which was greater in per foot, per hole, and total amount than in the later years.

The bottom panel shows that additions to reserves by means of new discoveries were greater in both 1945 and 1944 than in the 4 previous years. Also additions by extensions were larger in those 2 years than in any of the four earlier years except 1940. Only in the last mentioned year were the total new reserves from discoveries and extensions larger than withdrawals. Downward revisions of previous estimates of old fields, however, more than offset the additions and resulted in a net loss in reserves for 1940. Total additions to reserves through new discoveries, extensions, and revisions were greater than withdrawals in 1941, 1943, 1944, and 1945, but were less than withdrawals in 1942.

[7] F. H. Lahee, this *Bulletin;* Vol. 25, No. 6 (1941), p. 1001; Vol. 26, No. 6 (1942), p. 972; Vol. 27, No. 6 (1943), p. 720; Vol. 28, No. 6 (1944), p. 715; Vol. 29, No. 6 (1945), p. 637.

[8] Panels in Figure 3 are numbered from top to bottom.

It is evident that the oil industry in California functioned efficiently during the war years. Exploratory and development drilling were increased in order to secure more production to meet the steadily rising demand. The rewards obtained from the increased effort may not have been as great as desired but were much more satisfactory than was anticipated by the less sanguine forecasters a few years ago. California's position in regard to proved oil reserves was as good at the end of 1945 as it was at the beginning of the war in spite of the fact that new reserves credited to discoveries were discouraging in volume during the period 1940 to 1945.

The outlook for the near future is fairly clear in some respects. The steady upward trend of the past 6 years in exploratory drilling and production has ceased. Both production and drilling will be lower in 1946 than in 1945. There were several wildcat wells which gave indications at the end of last year that they might open new fields this year, or at least that they were close to potentially productive areas. Three of these promising wells were: General Petroleum's Librown No. 1, south of Santa Fe Springs; Richfield's U.P. Unit No. 1 in the Bandini area; and Standard Oil's Lewis Community No. 1 in the Leffingwell area. Other wells were exploring for new zones in numerous areas, among which Jacalitos and Cymric might be mentioned as offering possibilities for discoveries. It is considered probable that 1946 new pools and new fields will add at least as much to reserves as did those discovered in 1945.

The comment was made a year ago that the task of finding new oil in California was not an easy one, that it would require intensified exploration effort, and that it would grow increasingly more risky on account of decreasing percentage of success. The final remark, however, was that there were enough real marksmen in California to hit the elusive new oil pools in spite of all the obstacles in their line of fire. The results of 1945 corroborate those forecasts of a year ago.

The difficulty of finding new oil in California is greater than it was last year because the successes of 1945 have been withdrawn from the supply of pools waiting to be discovered. The marksmen, however, have had another year of intensive training during which they sharpened their sights and improved their aim. They did a fine job in 1945 and will continue to discover new oil this year.

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DEVELOPMENT IN CANADA IN 1945[1]

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ABSTRACT

During 1945 the search for oil was continued at about the same rate as in 1944 but there has been a considerable decline in production from 10,166,208 barrels in 1944 to 8,568,815 barrels in 1945. Two factors are mainly responsible for this situation. Firstly sufficient new production has not been found in western Canada to offset the normal decline of Turner Valley which in 1944 produced more than 80 per cent of Canada's oil and secondly the closing, on March 31, of the Canol pipe line, which provided an outlet for more than a million barrels of oil in 1944, has isolated the Norman Wells field except for local consumption which is relatively small.

Most of the drilling in 1945 was done in Alberta but considerable was done in Saskatchewan and the Mackenzie River area of Northwest Territories. In eastern Canada drilling has been continued in Ontario, Quebec (Gaspé), Prince Edward Island, New Brunswick, and Nova Scotia. No new fields were found but in Alberta a few widely scattered wells have yielded gas and some oil under promising conditions and further developments are occurring in these areas. In the eastern foothills west of Calgary the second Shell well on the front fold was proved to be unproductive. It was 1,018 feet lower structurally on the top of the Paleozoic limestone than the discovery well drilled in 1944. A third well in an intermediate position is being drilled. In the Brazeau area, 150 miles northwest of Calgary, and also in the foothills, a well reached the top of the possibly productive Paleozoic limestone at 9,498 feet but faulted back into Cretaceous strata before the main porous zones were reached. Sufficient gas was present, however, to encourage further developments.

On the southern Plains of Alberta, the Conrad field, discovered in 1944, was considerably extended in 1945 and new wells also enlarged the possibly productive area of the West Taber field. The Princess Devonian field, 125 miles east of Calgary, has been proved to be small and on other similar structures located by geophysical methods in the same general area no Devonian production has been found, although encouragement has resulted from production in higher beds.

The first commercial oil well in Saskatchewan began production in April, 1945, in the Lloydminster field on the Alberta-Saskatchewan boundary. Previously the oil production here had been wholly in Alberta. Production from 6 wells drilled in this field in Saskatchewan this year amounted to 15,857 barrels.

Nine wildcat wells were drilled in the Mackenzie River area in 1945 but none of these is productive.

INTRODUCTION

This report covers the oil developments in the whole of Canada. The main drilling in 1945 has been in Alberta with less amounts in Saskatchewan and in the Northwest Territories.

In eastern Canada activity has continued in Ontario, Quebec (Gaspé), Prince Edward Island, and Nova Scotia. In New Brunswick drilling was confined to the Stony Creek field.

Production in Canada (Barrels)	*1944*	*1945*
Alberta	8,788,845	8,055,440
Saskatchewan	—	15,857
Ontario	125,067	113,192
New Brunswick	22,972	31,027
Northwest Territories	1,229,324	353,099
Total	10,166,208	8,568,815

[1] Presented by title before the Association at Chicago, April 2–4, 1946. Manuscript received March 4, 1946.

[2] Geological Survey of Canada.

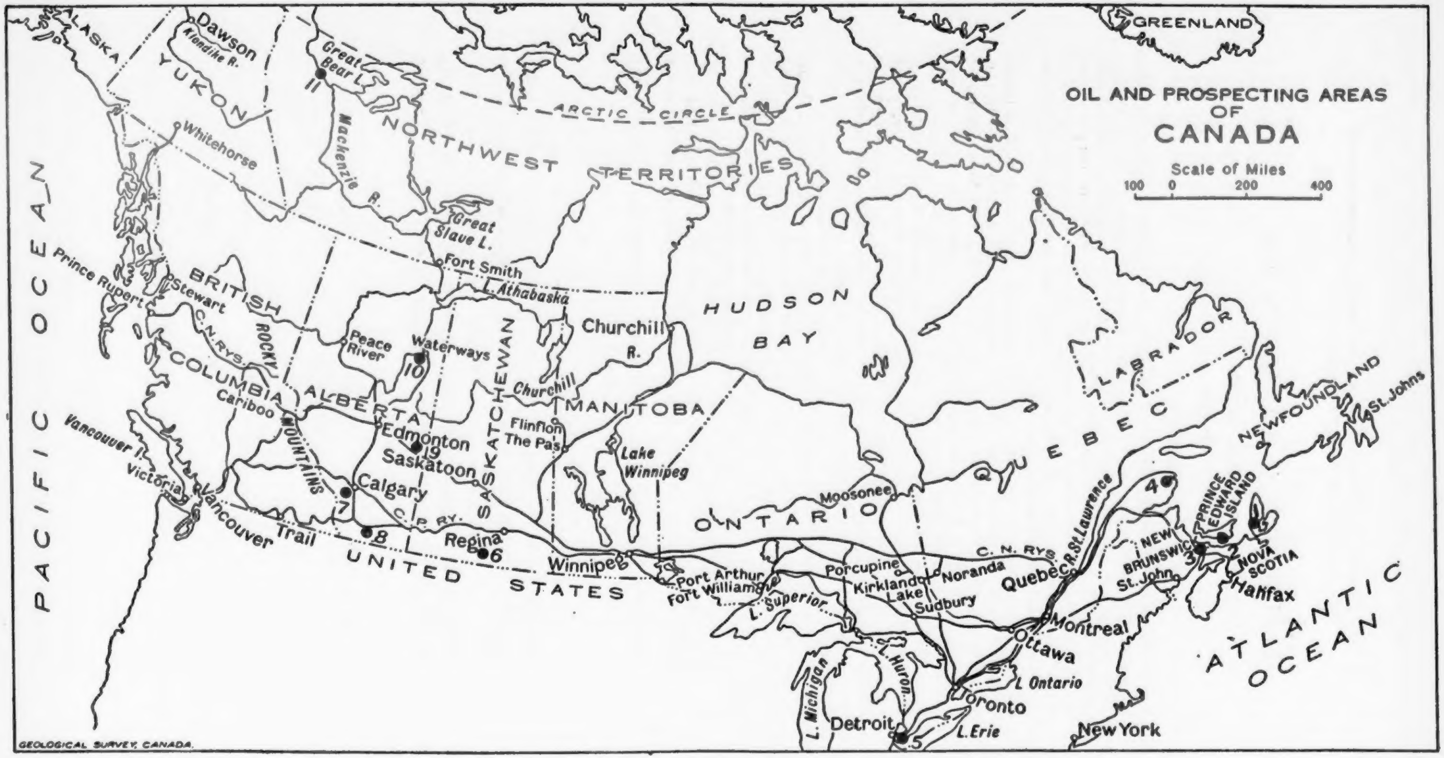

FIG. 1.—Oil and prospecting areas of Canada. 1, Mabou area, Cape Breton Island, Nova Scotia; 2, Hillsborough Bay, Prince Edward Island; 3, Stony Creek gas and oil field, New Brunswick; 4, Gaspé prospective oil area, Quebec; 5, Producing oil and gas fields, southwest Ontario; 6, Southern Saskatchewan wildcat areas; 7, Foothills in Calgary area, Alberta; 8, Southern Alberta fields and wildcat areas; 9, East-central Alberta fields; 10, Athabaska bituminous sands, northern Alberta; 11, Norman Wells field, Northwest Territories.

DEVELOPMENTS

Turner Valley.—In 1945 the number of wells completed in Turner Valley decreased mainly on account of the completion of the program undertaken by Wartime Oils, a Crown company, which sponsored drilling of marginal wells during the war. The number of available good drilling sites within the proved part of Turner Valley is now relatively small as no new extensions have been found in 1945. It is, therefore, possible that drilling may further decrease in 1946. This lack of sufficient drilling to provide new oil to offset the normal decline of the field has resulted in a decrease in production that has been continuous since the field reached its daily peak production in 1942. Two wells were drilled northwest of the north end of the Turner Valley field in 1945, but neither was completed at the end of the year. Attempts are to be made to revive production in Turner Valley by exploding large quantities of nitro-glycerine within the productive limestone.

Jumpingpound.—A second well drilled on the front fold at Jumpingpound, where a gas and oil well was completed in 1944, reached the top of the Paleozoic limestone at a depth of 10,639 feet or 1,018 feet structurally lower than the first well and failed to find production. The well was about 4,000 feet southwest of the first well so that any productive area on the west flank of the structure where this well was drilled must be relatively narrow. A third well is being drilled in an intermediate position between the productive gas-oil well and the dry hole.

Brazeau.—A well on the Brazeau foothills structure, 40 miles northwest of Nordegg, reached the top of the possibly productive Mississippian limestone at 9,498 feet, but after drilling 99 feet farther encountered a fault to Lower Cretaceous strata. The fault was above the main porous zones in the limestone although slight porosity gave some gas. The well is now being deepened and it is apparent the Mississippian limestone will again be encountered below 11,000 feet. The prospects of the fault block which contained the thin edge of the limestone wedge at the well site, is considered favourable in more westerly locations but until the present well is completed, the structure under and in front of the limestone wedge will not be definitely known. It is possible that the wedge of Mississippian limestone encountered at Brazeau is similar in type but much more deeply buried than the limestone of the same age in the fault block which is the Turner Valley field. The Brazeau area undoubtedly will receive further drilling in 1946 after the present well is completed.

FOLDS IN FRONT OF FOOTHILLS

Two wells drilled in front of the foothills structure east of the north end of Turner Valley during the early part of the year provided some important structural information. Extending from the International Boundary to south of Peace River are Tertiary deposits lying in the so-called Alberta syncline. Along the west edge of these Tertiary deposits, east of Turner Valley, the dips of the strata are to the east or northeast at about 50°. The amount of dip decreases rapidly east-

ward into relatively flat-lying beds and eventually passes into gently inclined west-dipping beds. The two wells referred to were drilled west of the edge of the east-dipping Tertiary beds on the west flank of the Alberta syncline. The interpretation of the subsurface structure from drilling data leads to the belief that the syncline, formerly considered a regional feature, is only superficial and that the Paleozoic limestone, with the exception of some minor flexures, has a regional gentle west dip across the whole of the Alberta syncline to the east edge of the foothills.

The explanation of the relatively high east dips of the surface Tertiary beds on the west side of the syncline, in contrast to the low west dip of the Paleozoic limestone at depth, seems to be related to the presence of east-dipping faults that are steep at the surface and become bedding-plane slips of much lower angle at depth. Such a condition brings about rotation of the surface beds on the upthrown or east side of the faults. Between the east-dipping faults and the large overthrust faults on the edge of the foothills there is an excessively crumpled zone in the higher beds only. Some east-dipping faults of the type postulated here have been mapped in front of the foothills. Apparently, however, they are much more important than formerly realized as the absence of any syncline in the Paleozoic limestone eliminates the possibility of the complementary anticline previously regarded as a part of the regional structure. It is not certain, however, over what area such a condition extends as from Highwood River south to the International Boundary the assumed presence of the Alberta syncline on the Paleozoic as well as higher beds seems to be necessary to explain the geological conditions as now understood. The presence of the Alberta syncline in the Paleozoic rocks from Bow River northward, however, is much more uncertain.

In central-western Alberta along the east edge of the foothills, Imperial Coalspur well was abandoned after reaching the Paleozoic limestone at a depth of 12,756 feet. At the end of the year Imperial-Shell's Stolberg well on a large fold in front of the foothills, near Nordegg, is drilling and testing a similar structure. This well also will be deep.

PLAINS OF ALBERTA

Princess.—The Princess field, 125 miles east of Calgary, is producing from the Devonian at a depth of around 3,900 to 4,000 feet. Seven wells were drilled in the field in 1945: of these 4 obtained oil, one obtained gas, one was plugged back as a gas well in the basal Lower Cretaceous sand and one was abandoned. The field now has 5 producing oil wells and probably can not be extended much farther.

A number of structures similar to the Princess field have been discovered in this general area by geophysical methods. One of these, 6 miles south of the Princess field has two producing gas and oil wells. The discovery was made in the weathered chert zone at the top of the Mississippian limestone. The Devonian was drilled in one of these wells but was unproductive. Two other wells drilled north of this area and south of the Princess field have given some valuable struc-

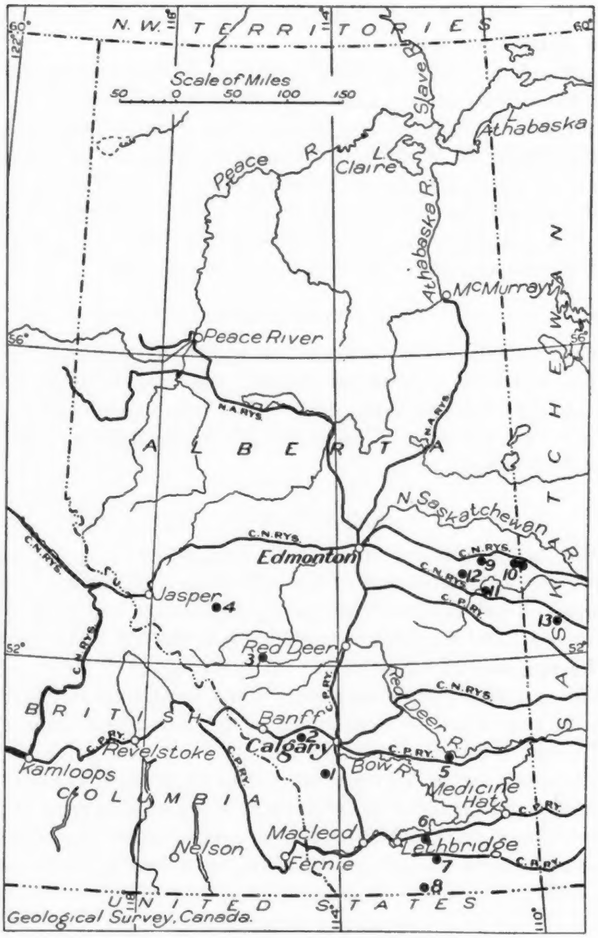

FIG. 2.—Active drilling areas in Alberta and western Saskatchewan. 1, Turner Valley; 2, Jumpingpound; 3, Rain River; 4, Brazeau; 5, Princess; 6, Taber and West Taber; 7, Conrad; 8, West Coutts; 9, Vermilion; 10, Lloydminster; 11, Wainwright; 12, Kinsella; 13, Unity, Sask.

tural data. One of these has some oil with a large gas flow in the basal Cretaceous sand and the other has gas in the basal sand of Colorado age.

West Taber.—Four new oil wells were drilled in this field in 1945 and it seems capable of further expansion.

Conrad.—Fifteen new oil wells were completed in this field in 1945 and several dry holes were drilled in outlining the producing area. The field is a

stratigraphic trap in the Jurassic and production is related to the tightness as well as to the distribution of the sand.

West Coutts.—A well drilled 10 miles northwest of Coutts on the International Boundary in the vicinity of Hay Lake, discovered oil in the top of the Mississippian limestone at a depth of nearly 3,100 feet. The structure, located by seismograph is a small knob of Mississippian limestone. A second well drilled only a quarter of a mile northeast proved unproductive so that the prospects in the immediate vicinity are not believed to be good for any considerable development. The results show, however, that on local structures on the north-plunging Sweetgrass arch oil has been trapped where south closure is present.

EAST-CENTRAL ALBERTA

Only one well was drilled in the Vermilion field in 1945 and this failed to yield oil but at Lloydminster on both the Alberta and Saskatchewan sides of the Provincial boundary the producing oil area has been extended. Important extensions have been made to the Kinsella gas field by the drilling of gas wells east of the presently developed area.

SASKATCHEWAN

Exploration was continued in southern Saskatchewan during 1945. Four wells, all dry, were completed and at the end of the year one was drilling. The first commercial oil well in Saskatchewan began production in the Lloydminster field in April, 1945, and 6 wells were producing at the end of December. Total production for 1945 was 15,857 barrels of 14° A.P.I. oil.

Gas was discovered 4 miles southwest of Unity in west-central Saskatchewan in 1944. During 1945 ten wells were drilled in this area and of these seven were gas wells. The gas occurs in two sands namely (1) a sand at about the same stratigraphic position as the Viking sand of Alberta in the lower part of Upper Cretaceous shales and (2) in a sand which may be an erosion product above the Paleozoic limestone. Gas from this area has been piped into Unity. The producing area is, as yet, relatively small but some of the wells have given substantial gas flows.

NORTHWEST TERRITORIES

During 1945 Imperial Oil Company, Limited, drilled nine wildcat wells and completed another in the Mackenzie river area. None of these was productive. The Canol pipe line was shut down on March 31, and production of the Norman Wells field since that time has been for local use only. There is a continuous demand for oil in the mining camps on the east side of Great Bear and Great Slave lakes. Production in 1945 from the Northwest Territories was 353,099 barrels. During 1944 when the Canol pipe line was in continuous operation the production was 1,229,324 barrels.

ONTARIO

A vigorous drilling program has been carried on in Zone Township, Kent County, southwestern Ontario, following the discovery of a gas field in 1944, a few miles from the old oil field at Bothwell. The gas comes from Upper Silurian (Salina) beds. Also in 1944 the Imperial Oil Company Ltd., inaugurated a drilling program, in Kent and Lambton counties, in the search for further small oil fields. Several unsuccessful wells have been completed and the drilling is being continued. One of these wells reached the pre-Cambrian.

QUEBEC

In the Gaspé peninsula of Quebec Continental Petroleums Ltd., of Montreal, is active but there were no new drilling developments in 1945.

PRINCE EDWARD ISLAND

The deep test of the Island Development Company in Hillsborough Bay, Prince Edward Island, was abandoned in 1945 at the depth of 14,696 feet. This is the deepest well ever drilled in Canada. The well finished in salt, presumably Mississippian in age.

NOVA SCOTIA

The well of the Sun Oil Company on the Minudie anticline south of Amherst was abandoned at the depth of 6,506 feet on account of mechanical troubles that developed in drilling a thick succession of salt beds. A second well will be drilled. Nova Scotia Oil and Gas Company is drilling a well in Hants County, 40 miles north of Halifax, and at the end of the year had reached a depth of 870 feet.

ATHABASKA BITUMINOUS SANDS, ALBERTA

In the McMurray area after only preliminary runs the Abasand plant again burned down in June. The loss was particularly unfortunate as under Dominion Government sponsorship the plant would soon have been capable of continuous runs at its capacity of 500 to 600 barrels a day when it would have been possible to more accurately evaluate costs of a possible commercial operation. No arrangements have been made for rebuilding.

At Bitumont, 50 miles down Athabaska River from McMurray, Oil Sands Ltd., under Provincial Government sponsorship is building a plant but it is unlikely to be ready for operations until late in 1946.

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WILDCAT WELLS COMPLETED IN 1945

Well	*Location LS-Sec-Tp-Rg-Mer*	*Depth in Feet*	*Age of Strata Reached*	*Results*
ALBERTA FOOTHILLS				
Arrow Marjon	Ls. 10-12- 6- 2 W5	5,224	Faulted from Lower to Upper Cretaceous	Suspended
Elbow Falls 2A	Ls. 4-28-22- 6 W5	2,628	Cambrian?	Gas. Susp.
Jasper 1	Ls. 2-19-49-26 W5	5,096	Dev.	Aband.
Phillips Sullivan Creek 1	Ls. 3-22-18- 5 W5	2,666	Jurassic	Susp.
Pekisko Hills	Ls. 6- 6-17- 2 W5	5,559	Miss.	Susp.
[1]Royalite New Valley	Ls. 2-22-21- 3 W5	10,259	Miss.	Aband.
[1]Shell 10-14 J	Ls. 10-14-25- 5 W5	10,959	Miss.	"
SOUTHERN PLAINS				
[2]Admiral—British Dominion 1	Ls. 7-22- 1-17 W4	3,095	Miss.	Oil
[2]Admiral—British Dominion 2	Ls. 10-22- 1-17 W4	3,080	"	Aband.
Bullshead	Ls. 14-34- 8- 7 W4	4,763	Dev.	"
B. & B. Syn.	Ls. 1-29- 5-17 W4	3,445	Miss.	"
Burdett Prov. 1	Ls. 5-22- 8-11 W4	4,313	Dev.	Aband.
" " 2	Ls. 1-10- 8-11 W4	3,210	Miss.	"
" " 3	Ls. 9-25- 7-12 W4	3,062	Miss.	"
Calling Valley 1	Ls. 6-24-21- 3 W5	10,025	Miss.	"
Empire 1	Ls. 7-11-15-11 W4	4,186	Dev.	"
[2]Empire Pacific 1	Ls. 1-27-19-12 W4	3,323	Weathered zone at top of Miss.	Oil
Empire Pacific 2	Ls. 16-22-19-12 W4	4,300	Dev.	Plugged back. Gas and oil in Miss.
Empire Conrad 1	Ls. 12-16- 6-15 W4	3,163	Miss.	Aband.
Foremost Prov. 2	Ls. 4-25- 6-12 W4	4,281	Dev.	"
Foremost Prov. 3	Ls. 9-15- 7-12 W4	3,336	Miss.	"
Fraser Alta. Govt.	Ls. 4-13- 2-11 W4	2,700	Miss.	"
Goyette Solloway	Ls. 9-30-20- 7 W4	4,500	Dev.	"
Homestead—New Ranchmen's	Ls. 15-36-21-14 W4	3,375	Miss.	"
Imp. Clancey Raymond	Ls. 7-16- 6-20 W4	5,600	Dev.	"
Imp. Coalspur	Ls. 10- 3-49-21 W5	12,955	Miss.	"
" Tempest 1	Ls. 4-27- 9-19 W4	5,112	Dev.	"
" " 2	Ls. 3-24- 9-19 W4	3,550	Miss.	"
" Stirling 1	Ls. 4-15- 7-19 W4	5,497	Dev.	"
" Chin 1	Ls. 4- 8- 9-18 W4	3,472	Miss.	"
" " 2	Ls. 4-15- 9-18 W4	3,454	Miss.	"
" Grassy Lake 3	Ls. 2-35-10-13 W4	6,400	Cambrian	"
McColl Fron.—Br. Dom. 1	Ls. 9-29- 6- 7 W4	3,422	Miss.	"
Mid. Cont.—Br. Dom. 1	Ls. 6-27- 7-17 W4	3,438	Miss.	"
MacIntyre 3	Ls. 11-24- 3-22 W4	1,210	U. Cret.	"
Millicent C.P.R.	Ls. 13-17-20-13 W4	4,277	Dev.	"
[2]Nat. Empire 1	Ls. 10-34-19-12 W4	3,288	Miss.	Gas & oil
[2]Peerless 1	Ls. 4-18-20-11 W4	3,184	L. Cret.	Oil
Patricia C.P.R.	Ls. 4- 6-20-12 W4	4,319	Dev.	Gas L. Cret.
Rainy Hills	34-19-10 W4	4,095	Dev.	Aband.
Toronto Syn. 1	Ls. 8-21- 1-20 W4	4,379	Dev.	"
" " 2	Ls. 4- 6-22-13 W4	4,600	"	"
Verm. Cons. Oils 15	Ls. 6-12-49- 6 W4	4,632	Cambrian	Susp.
Western Drilling Twin River	Ls. 16- 3- 2-20 W4	5,508	Dev.	Aband.
Wesreserve	Ls. 7-36-23- 4 W5	5,959	U. Cret.	"
Wrentham Prov. 2	Ls. 16-12- 6-17 W4	3,470	Miss.	"
" " 3	Ls. 13-13- 6-17 W4	3,281	"	"

[1] Began drilling west of structural edge of foothills but drilled through overlying thrust plate.
[2] Discovery oil well.

WILDCAT WELLS COMPLETED IN 1945
continued

Well	*Location LS-Sec-Tp-Rg-Mer*	*Depth in Feet*	*Age of Strata Reached*	*Results*
EAST-CENTRAL ALBERTA				
Cameron Helena	Ls. 4-24-52-12 W4	2,787	Dev.	Aband.
Edgerton 2	Ls. 3-20-43- 4 W4	2,750	"	Oil shows aband.
Edgerton 3	Ls. 9-18-43- 4 W4	2,462	Dev.	Susp.
Iscris 2	Ls. 14-36-53- 6 W4	2,395	Dev.	Aband.
Lloyd. Oil Prod.	Ls. 8- 9-50- 2 W4	1,990	L. Cret.	"
Martin 1	Ls. 2-17-42- 6 W4	2,996	Dev.	Gas L. Cret.
" 2	Ls. 12- 9-42- 6 W4	2,497	L. Cret.	Aband.
North Peace Syn.	Ls. 4-36-50- 3 W4	2,018	L. Cret.	Susp.
SASKATCHEWAN				
Aberdeen	Ls. 9- 6-39- 2 W3	1,784	Dev.	Aband.
Imp. Elbow	Ls. 12-25-23- 6 W3	5,567	Ord.	"
" Morse	Ls. 1- 6-18- 7 W3	6,796	Ord. or Camb.	"
" Swift Current	Ls. 11-20-13-13 W3	7,890	" " "	"
Norcanols Pennant	Ls. 4-14-18-16 W3	6,823	" " "	"
Twin Prov.	Ls. 6-21-11-29 W3	3,970	Miss.	Susp.
Palo 1	Ls. 11-36-36-17 W3	1,995	Cret.	"
NORTHWEST TERRITORIES				
Mackenzie River Valley adjoining Norman Wells area.				
Canyon No. 1		2,066	Mid. Dev.	Aband.
" No. 2		805	Up. "	"
Judile No. 1		2,815	Silurian? Bear Rock	"
Loon Creek No. 1		5,452	Silurian	"
" " No. 2		5,093	Cambrian	"
Loonex		4,564	Silurian? Bear Rock	"
Raider Island		2,190	Up. Dev.	"
Sans Sault		3,291	Completed from 3,123 in Bear Rock, Silurian?	"
Seepage Lake		1,636	Mid. Dev.	"
Vermillion Ridge No. 1		5,972	Cambrian	"
ONTARIO				
Union Imp. No. 1	Lot 1, Con. 4, Chatham Tp.	3,680	Pre-Camb.	Aband.
Imp.—H. Renwick 1	" 15, " 10, Tilbury "	535	Devonian	"
Imp.—Ferguson 1	" 12, " 4, Harwich "	1,738	Silurian	"
Imp.—Campbell 1	" 21, " 4, Harwich E."	655	Devonian	"
Imp.—Bokar 1	" 16, " 2, " "	746	"	"
Imp.—Cowan 1	" 8, " 12, Orford "	551	"	"
Imp.—Van Damme 1	" 14, " 13, Sombra "	820	"	"
Imp.—Lozan 1	" 5, " 8, Dover E. "	539	"	"
Shaw Construction Co.	" 25, " 4, Sarnia "	586	"	"
PRINCE EDWARD ISLAND				
Island Dev. Co. Hillsborough 1	Hillsborough Bay	14,696	Miss.	Aband.
NOVA SCOTIA				
Sun Oil Co.	Cumberland Co. South of Amherst	6,506		Aband.

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DEVELOPMENTS IN APPALACHIAN AREA IN 1945[1]

APPALACHIAN GEOLOGICAL SOCIETY[2]
Charleston, West Virginia

ABSTRACT

NEW YORK. In the Oriskany development in New York state 20 wells were completed and 16 were drilling. There were no new discoveries. Activity centered on the 1944 discovery in Tuscarora Township, Steuben County, where 6 producing wells had a combined open flow of 58,000 MCF to prove about 700 acres and outline the new South Addison field with 5 dry holes. This field produced over two-thirds of the total 6,940,000 MCF of gas taken from Oriskany fields during the year, and added 6 billion cubic feet to the Oriskany gas reserves.

Table I presents the results of deep drilling in 1945 and Figure 1 shows the location of Oriskany fields and the 14 wildcat wells in operation in New York during the year. Total Oriskany gas produced from these fields since their discovery in 1930 is over 141 billion cubic feet.

In the Medina gas belt along Lake Erie there were no significant developments.

In the oil-producing area of southwestern New York well completions dropped from 1,488 in 1944 to 1,350 in 1945 and daily average production dropped from 13,075 barrels to 12,402 barrels.

Leasing activity was confined to the area surrounding the new Oriskany field and to the acquisition of blocks around wildcat wells and in areas for future testing. Exploration geological and geophysical work was practically dormant.

PENNSYLVANIA. A decline of 19 per cent occurred in the number of wells completed in the shallow gas territory of western Pennsylvania (Upper Devonian or higher) in 1945 as compared with 1944. Although a number of gas wells with initial open flows in excess of one million cubic feet per day were brought in at several widely separated localities, only one new gas pool of significant size was developed. This is a Haskell sand pool south of the Bradford oil pool in McKean County.

There was a slight decline in the number of wells drilled in connection with water-flooding in the northern oil district and air-drives in the middle district. Oil production in the Bradford field showed a further decline of 11 per cent during 1945, but the field still accounted for 50 per cent of the total Pennsylvania-grade crude oil production of the Appalachian province. In the middle and southwestern districts, oil production increased 3 per cent due mainly to the more intensive application of air-drives in the middle district. A Haskell sand oil pool of modest size was discovered in Keating Township, McKean County, and a small Gordon sand pool in North Strabane Township, Washington County.

Ten deep wells (Onondaga or deeper) were completed in western Pennsylvania in 1945 and one well was abandoned above the Onondaga at a depth of 7,467 feet after it had crossed a fault zone. Of the ten completed, one in the Tioga field is being used in connection with the underground storage of gas in that field, and the others were abandoned as dry holes in the deeper sands.

OHIO. One thousand thirty-four completions were listed for Ohio during the year. Of these 220, or 21.3 per cent, were oil wells, 429, or 41.5 per cent, were gas wells and 385, or 37.2 per cent, were dry.

One hundred fifty-eight holes tested the shallow sands above the Berea, 225 penetrated the Berea, 8 were carried into the Ohio shale of Devonian age, 42 were planned as Oriskany tests, 7 reached the Newburg horizon in the base of the Salina group, and 575 were drilled through the Clinton sand, the most important producing formation in the state.

Little activity was reported in the Trenton fields in northwestern Ohio where only 5 gas wells, 5 oil wells and 7 dry holes were completed.

A sub-Trenton test in an older part of the Clinton field in Ashland County gauged 220 MCF from the lower Magnesian dolomite between 4,420 and 4,434 feet but water was encountered at a depth of 4,537 feet. The hole was carried to a depth of 5,251 feet and abandoned but this encouraging showing will result in further testing of this formation. The only other sub-Trenton test was drilled in Ross

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County and was dry. Although few holes have been drilled in that part of the state, the information gained by this test is said to indicate better structural conditions in the immediate vicinity and further drilling may result.

The only important new field opened during the year is in Columbiana and Mahoning counties where 14 gas wells and 11 dry holes were completed. This production is from a stratigraphic trap along the western edge of the Oriskany sand at an average depth of 3,600 feet. The discovery well had an open-flow capacity of 6,000 MCF and a closed pressure in excess of 1,300 pounds.

West Virginia. The amount of drilling was somewhat less than that of 1944 as is indicated by the completion details for the state. No new oil fields or pools were discovered, but current outpost drilling was fairly successful. One Oriskany sand gas discovery was made in Jackson County, this resulting in a new pool with 10 productive wells by the end of the year.

The Blue Creek Oriskany sand pool in Kanawha County, discovered in 1944, was further developed to the extent of 9 producing wells.

In the shallow sands, from the Berea sand upward, there were two successful wild cats in Logan County and one in Raleigh County.

At year's end the most concentrated drilling was in Wyoming County where gas production is being developed in the Ravencliff, Maxton, Weir, and Berea sands and in the Greenbrier limestone.

Kentucky. No new oil or gas pools were discovered in eastern Kentucky during 1945 and proven areas produced 1,524,764 barrels of oil and a total of 123,203 MCF was developed by the completion of 216 new gas wells. South-central Kentucky, which includes the old Allen, Barren, Cumberland, and Wayne County pools, produced 232,361 barrels of oil, 121,171 barrels coming from new pools and extensions in Clinton County. For the first time in its oil history Kentucky passed the 10,000,000-barrel mark by producing a total of 10,019,641 barrels of oil; however, western Kentucky produced 8,262,516 barrels of this total.

The most important wildcat well in eastern Kentucky during the year was drilled near Hyden in Leslie County which encountered 133 MCF in the "Big Six" sand of Silurian age. This wildcat is located 17 miles from production.

The most outstanding oil developments were extensions to the pools in Elliott, Menifee, and Jackson counties.

Tennessee. Oil production in 1945 in Tennessee east of the Cincinnati arch was slightly more than 6,000 barrels, most of which came from the Mississippian limestone in Scott and Morgan counties. Thirty million cubic feet of gas was marketed off the lease in Morgan County and about 10 million cubic feet was produced in the Jamestown field in Fentress County.

There were five completions during the year and all were dry holes. The most significant test, drilled in Cumberland County, abandoned at 3,707 feet. A small showing of oil was found at 3,429–3,435 feet, 79 feet below the top of the Knox dolomite group.

There was considerable amount of leasing in the Mississippi Embayment area in western Tennessee late in the year.

New York

ORISKANY AREA

CHAUTAUQUA, CATTARAUGUS, ALLEGANY, STEUBEN, CHEMUNG, SCHUYLER, TOMPKINS, WYOMING COUNTIES

There were 36 wells in operation in the Oriskany area of New York state during the year 1945, representing a return to the activity developed in 1943. Of this total 16 were drilling, 20 were completed, and 14 were wildcat tests located over 2 miles from production. None of the 7 wildcat wells completed was successful, but 7 producing wells were completed for a total combined open flow of 66,000 MCF.

By far the majority of the 1945 Oriskany development took place in the newly discovered South Addison field in the northwest corner of Tuscarora Town-

ship, Steuben County, where 11 wells had been completed and 9 were drilling at the close of the year. Five of the completions were dry holes or encountered salt water, while the six producers had a combined open-flow capacity of 58,000 MCF. The field has been fairly well outlined now and appears to be about 3 miles long and ¼ to ½ mile wide, comprising approximately 700 acres.

The other producer completed during the year was the Empire Gas and Fuel Company's John Lewis No. 1 for 8,000,000 open flow, drilled as an extension of the western end of the Independence field to provide additional volume.

K. R. Wilson's deep test on his own land in the village of Arcade, Wyoming County, had progressed to 7,065 feet, only 500 feet deeper than at the beginning of the year. A summary log of this well was included in the 1944 review (Vol. 29, No. 6, p. 667). As last reported the well was in a sandy formation, leading to the belief that the basement complex may not have been reached.

One wildcat test was completed, and one drilling, in Chautauqua County by the Appalachian Development Corporation as an extension into New York of that company's drilling program in Pennsylvania for an Oriskany stratigraphic trap.

Information on the results of deep drilling in New York is compiled in Table I and a map (Fig. 1) gives the location of the wildcat wells and the Oriskany fields of the state.

Oriskany gas production for the year was 6,940,000 MCF, more than double the amount produced in 1944. As over 4 billion was produced from the new South Addison field, production from other fields dropped off about ½ billion from the previous year.

Estimated total reserves for the new field are 6 billion cubic feet and over two-thirds of that was produced during 1945. Production withdrawals have been highly competitive and the field rock pressure has dropped from an initial of 2,020 pounds per square inch to 415 on the most recent well completed.

Oriskany fields producing gas in 1945 were West Union, Woodhull, South Addison, Beech Hill, State Line, Independence, Howard, Groton, and Elmira. There was no production from the Allen, Andover, or Jasper fields and the Greenwood and Dundee fields were used for storage.

Total Oriskany gas produced from New York fields from its original discovery in the Dundee field in 1930 to date has been slightly in excess of 141 billion cubic feet.

Leasing activity continued to be slow. Several large blocks have been acquired around wildcat tests and in areas held for future testing and there has been the customary play along trend in the Tuscarora Township area.

Geological and geophysical work in the area have been almost forgotten since 1942. Locations have been made on the basis of work done previous to that time and many of the prospective areas are being exhausted. There is a very definite need for more and better detail in structural exploration work.

TABLE I

DEEP DRILLING IN NEW YORK STATE IN 1945

County	Township	Company	Map No.	Well	Field	Class	Testing	Results	Completed
Allegany	Alfred	EGF	1	F. S. Cornelius 1		Wildcat	Oriskany	S.W. Abd.	11/8
"	"	"	2	Cy Rennels 1		"	"		Location
"	Friendship	"	3	Geo. Hackett 1		"	"	Dry. Abd.	11/20
"	Independence	"	4	Earl Green 1	Independence	Extension	"	S.W. Abd.	4/10
"	"	"		John Lewis 1	"	"	"	8,000 MCF	8/7
"	Willing	"	5	H. Seaver 1		Wildcat	"		Rigging up
Chautauqua	Mina	AD	6	E. Stetson 1		"	"	Dry Abd.	11/22
"	Portland	"	7	W. S. Howell 1		"	"		Shut down 1,900 feet
Chemung	Horseheads	Smith et al.	8	H. Hoover 1		"	"		Shut down 1,900 feet
Steuben	Bath	AD	9	M. Faucett 1		"	"	10 MCF S.W. Abd.	6/5
"	"	"	10	W. Schmiedecker 1		"	"	Dry Abd.	11/22
"	Erwin	AG et al.	11	M. Landers 1		"	"		Building rig
"	"	"	11	Troy-Powers 1		"	"	S.W. Abd.	9/13
"	"	Liederbach et al.		F. C. Platt 1		"	"		Location shut down
"	Greenwood	AD	12	J. Armstrong 1		"	"	S.W. Abd.	12/13
"	Tuscarora	AD et al.		F. Long 1	South Addison	Extension	"	9,900 MCF	8/20 I.R.P. 1,450 lbs.
"	"	AG		E. C. Smith 1	"	"	"		Drilling 4,241 feet
"	"	AG et al.		L. Williams 1	"	"	"		Location
"	"	AG et al.		D. Wilson 1	"	"	"	Dry Abd.	11/22
"	"	Cunningham		A. Dininny	"	Inside	"		Drilling 2,710 feet
"	"	Evjen		J. Morris 1	"	"	"		Fishing 4,400 feet
"	"	HB		T. McTamney 1	"	Extension	"	Dry Abd.	6/30
"	"	A. Heider et al.		J. Coon 1	"	"	"	S.W. Abd.	8/16
"	"	NYSN		F. Bates 1	"	Inside	"	1,200 MCF	12/6 I.R.P. 630 lbs.
"	"	NYSN		H. M. Chase 1	"	Extension	"	3 MCF S.W. Abd.	11/8
"	"	NYSN	13	G. Lemunyan 1	"	"	"		Drilling 335 feet
"	"	NYSN		W. Long 1	"	Inside	"	4,000 MCF	11/22 I.R.P. 665 lbs.
"	"	NYSN		J. Putnam 1	"	Extension	"	17,000 MCF	8/9 I.R.P. 1,475 lbs.
"	"	SC		W. Dininny 1	"	Inside	"	2,696 MCF	Drilling I.R.P. 415 lbs.
"	"	"		J. Gardner 1	"	"	"	7,740 MCF	12/6 I.R.P. 630 lbs.
"	"	"		B. McCarthy 1	"	Extension	"	15,475 MCF	8/16 I.R.P. 1,440 lbs.
"	"	Rogers & Bryson		E. Edwards 1	"	Inside	"		Drilling 2,435 feet
"	"	Rogers et al.		Esterbrook 1	"	"	"		Location
"	Woodhull	Cunningham	14	W. Holt 1	"	Extension	"		Location
"	"	NYSN	15	Bliss (Reynolds)	"	"	"	Dry Abd.	5/10/45
Wyoming	Arcade	K. R. Wilson	16	K. R. Wilson 1	"	Wildcat	Basement complex		Drilling 7,065 feet

AD—Appalachian Development Corp.
NYSN—New York State Natural Gas Corp.
HB—Hanley & Bird
SC—Sylvania Corp.
AG—Alleghany Gas Company
EGF—Empire Gas & Fuel Co., Ltd.

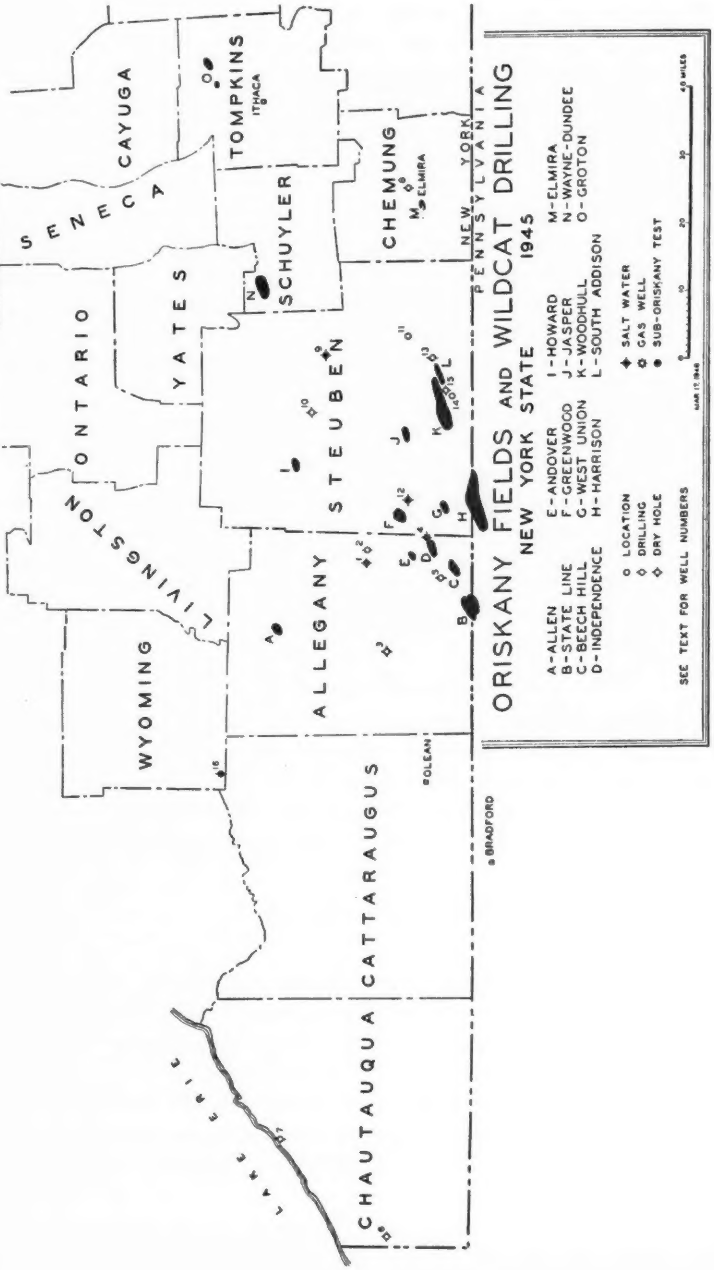
ORISKANY FIELDS AND WILDCAT DRILLING
NEW YORK STATE
1945
A-ALLEN
B-STATE LINE
C-BEECH HILL
D-INDEPENDENCE
E-ANDOVER
F-GREENWOOD
G-WEST UNION
H-HARRISON
I-HOWARD
J-JASPER
K-WOODHULL
L-SOUTH ADDISON
M-ELMIRA
N-WAYNE-DUNDEE
O-GROTON
LOCATION
DRILLING
DRY HOLE
SALT WATER
GAS WELL
SUB-ORISKANY TEST
SEE TEXT FOR WELL NUMBERS
0 10 20 30 40 MILES
MAR 17 1946
CAYUGA
TOMPKINS
ITHACA
SENECA
SCHUYLER
CHEMUNG
ELMIRA
ONTARIO
YATES
STEUBEN
LIVINGSTON
ALLEGANY
WYOMING
CATTARAUGUS
OLEAN
BRADFORD
CHAUTAUQUA
LAKE ERIE
NEW YORK
PENNSYLVANIA

FIG.

MEDINA AREA

CHAUTAUQUA, CATTARAUGUS, ERIE, AND NIAGARA COUNTIES

Very little information on activities in the area of Medina production is available. Some development drilling was carried on, primarily for storage, by the larger companies and private interests drilled a few scattered wells.

OIL-PRODUCING AREA

ALLEGANY, CATTARAUGUS, AND STEUBEN COUNTIES

Well completions in the secondary recovery drilling program in the Allegany field (Allegany and Steuben counties) dropped to 1,140 this year as compared with 1,238 in 1944, due solely to the severe winter conditions in the first quarter of the year. Wells were divided about one-third to water input and two-thirds to oil producing. Completions on the Cattaraugus County side of the Bradford field are estimated at about 210 wells.

Daily average production for the year from the Allegany field was 9,765 barrels as compared with 10,118 barrels in 1944, and from Cattaraugus County was 2,637 barrels as compared with 2,957 in 1944.

There was much less wildcatting for shallow oil during the year and practically no new leasing. One well on the Donelson farm in Busti Township, Chautauqua County, 5 miles south of Jamestown, New York, was completed in 1946 before this went to press for about 2 barrels per day after shot, but the eventual capacity of the well could not be judged. Approximately 7,000 acres of leases have been reported taken up in the area.

PENNSYLVANIA[3]

A considerable decrease in drilling activity occurred in the shallow-gas territory of western Pennsylvania (Upper Devonian or higher) during 1945 and a slight decrease in the oil fields. The number of deep tests (Middle Devonian or deeper) completed was two less than in 1944 and these did not open any new reserves of natural gas. Thus far, no commercial oil has been encountered in sands below the Upper Devonian in Pennsylvania.

SHALLOW-SAND DEVELOPMENTS

GAS

During 1945, 691 wells were completed in the shallow-sand gas territory of western Pennsylvania, as compared with 855 in 1944, a decrease of 19 per cent. Of the shallow wells drilled for gas, 75 per cent were producers and 25 per cent were dry. The 520 new gas wells had a total initial open-flow capacity of 148,662,000 cubic feet of gas per day, as compared with the total initial open-

[3] Published by permission of the State geologist of Pennsylvania. In connection with the preparation of this review, the writer wishes to acknowledge the cooperation of Parke A. Dickey, George J. Donaldson, Jr., George C. Grow, Jr., D. T. Secor, and Wilbur H. Seifert who contributed part of the data.

flow capacity of 124,684,000 cubic feet of the 625 new gas wells completed in 1944.

Southwestern Pennsylvania.—Shallow-well completions in the gas fields of southwestern Pennsylvania are shown in Table II. The 292 new gas wells had a total initial open-flow capacity of 99,663,000 cubic feet of gas per day. No new gas pools of significant size were discovered in southwestern Pennsylvania during

TABLE II
SHALLOW-WELL COMPLETIONS IN SOUTHWESTERN PENNSYLVANIA GAS FIELDS IN 1945

County	*Completions*		*Gas*			*Dry*	
	Number of Wells	*Average Total Depth (Feet)*	*Number of Wells*	*Average Initial Open-Flow MCF per day*	*Total Depth (Feet)*	*Number of Wells*	*Average Total Depth (Feet)*
Allegheny	33	2,991	24	843	2,915	9	3,192
Armstrong	99	2,883	89	124	2,683	10	2,766
Beaver	3	863	1	4	945	2	823
Butler	18	1,659	9	40	1,845	9	1,474
Fayette	47	2,557	39	615	2,408	8	3,283
Greene	62	2,897	48	221	2,910	14	2,852
Indiana	31	3,274	23	701	3,210	8	3,458
Washington	53	2,677	32	224	2,526	21	2,909
Westmoreland	37	3,130	27	378	2,931	10	3,667
Total	383	2,811	292	341	2,787	91	2,889

1945. Wells with initial open-flow capacities in excess of one million cubic feet of gas per day were reported as follows: two in Marshall and three in Patton Township, Allegheny County; one in Burrell and one in Red Bank Township, Armstrong County; four in German, two in Luzerne, and one in Springhill Township, Fayette County; one in Cumberland Township, Greene County; three in Washington and one in West Mahoning Township, Indiana County; one in North Strabane Township, Washington County; and two in Bell, one in Hempfield, one in Huntingdon, and one in Mount Pleasant Township, Westmoreland County.

Northern and middle districts.—A summary of activities in the shallow-gas territory of the northern and middle districts during 1945 is given in Table III. The 228 new gas wells had a total initial open-flow capacity of 48,999,000 cubic feet of gas per day.

A new Haskell sand gas pool was opened in Hamlin and Lafayette Townships, McKean County, in 1945, east of a smaller pool discovered in 1944. Thus far, it appears as though the two are not connected. At the end of the year there were 33 producing wells. The limits of the pool are fairly well defined, except on the south, and it appears that the final area will be between 2,700 and 4,000 acres. Initial open flows are variable, ranging between 100,000 and 3,000,000 cubic feet of gas per day. Initial reservoir pressure was 845 pounds per square inch.

TABLE III

SHALLOW-WELL COMPLETIONS IN NORTHERN AND MIDDLE PENNSYLVANIA GAS FIELDS IN 1945

County	*Completions*		*Gas*			*Dry*	
	Number of Wells	*Average Total Depth (Feet)*	*Number of Wells*	*Average Initial Open-Flow M.C.F. Per Day*	*Average Total Depth (Feet)*	*Number of Wells*	*Average Total Depth (Feet)*
Clarion	31	2,348	25	97	2,250	6	2,742
Clearfield	9	3,361	3	87	3,358	6	3,362
Crawford	1	2,630	0	0	0	1	2,630
Elk	26	2,572	23	195	2,536	3	2,851
Forest	33	1,682	16	355	1,786	17	1,584
Jefferson	101	2,730	82	163	2,718	19	2,781
McKean	59	2,465	43	473	2,405	16	2,626
Mercer	3	550	2	75	525	1	600
Potter	28	2,000	22	52	1,700	6	3,100
Venango	11	1,629	9	57	1,651	2	1,533
Warren	6	1,540	3	221	1,221	3	1,859
Total	308	2,383	228	215	2,353	80	2,468

Two more gas wells were drilled in the shallow-sand gas pool discovered on the east side of the Allegheny River south of Corydon in northeastern Warren County in 1944, but these did not greatly extend the boundaries of the pool. No pipe-line connection had been made by the end of the year and the potentialities of the pool, therefore, are still unknown. A well with an initial open-flow capacity of 2,763,000 cubic feet of gas per day was completed in Washington Township, Jefferson County.

OIL

A slight decrease in drilling activity occurred in the oil fields of western Pennsylvania, 3,271 new wells being completed in 1945, as compared with 3,375

in 1944, a decrease of 3 per cent. Most of the drilling was done in connection with secondary-recovery operations, either water-flooding or air-drive projects. Two small oil pools were discovered.

In the Bradford field, 2,351 new wells were drilled, about half of which were water-intake wells, as compared with 2,436 in 1944, a decrease of 3.5 per cent. Oil production in this field, about 86 per cent of whose area lies in Pennsylvania, dropped from 12,162,522 barrels in 1944 to 10,792,988 barrels in 1945, or 11 per cent. The field accounted for 50 per cent of the total Pennsylvania-grade crude oil production of the Appalachian province in 1945.

The number of new wells completed in the middle and southwestern districts of Pennsylvania in 1945 was 920 as compared with 939 in 1944, a decrease of 2 per cent. In the Venango part of the middle district 283 air-intake and 354 oil wells were drilled. Oil production in the middle and southwestern districts of Pennsylvania increased from 3,099,300 barrels in 1944 to 3,201,600 barrels in 1945, or 3 per cent. The 1945 production represented 15 per cent of the total Pennsylvania-grade production.

A discovery of oil in the Haskell sand was made by G. E. Olsen on the John Tanner farm in Kent Hollow, near Coryville, Keating Township, McKean County, in 1945. The location is about a mile southwest of an old small Haskell oil pool at the mouth of Potato Creek along the Allegheny valley and about ¾ mile northwest of another very small pool. The discovery was rapidly extended southwest by 12 producing wells. Three dry holes tend to limit the pool to about 600 acres. Highest initial production reported was about 25 barrels per day, and the majority of the wells quickly settled to 2–8 barrels per day on the pump. The pay sand appears to be 15 to 20 feet thick and of low permeability. Four wells have also been drilled around the two old pools in an effort to extend them. The pool extends for 2½ miles along the northwest flank of the Smethport anticline. Preliminary correlations indicate that the Haskell sand is stratigraphically nearly the same as the Haskell sand of the two recently discovered gas pools in Hamlin and Lafayette Townships. The sand appears to pinch out downdip. The same or a closely related sand has produced gas for many years in the Open Brook gas pool on the crest of the Smethport anticline, 3 miles southeast. The reservoir pressure of the new wells is low, and it appears probable that the pool is a downdip flank accumulation, whose pressure has been reduced by gas production from the large gas cap at the crest of the structure.

In North Strabane Township, Washington County, Chas. E. Young and associates discovered a small Gordon sand oil pool in the spring of 1945 that resulted in considerable drilling activity in the vicinity. The location is about 6 miles northeast of Washington, Pennsylvania, in an area that had already been drilled fairly closely. Three wells with initial productions ranging from 40 to 100 barrels of oil per day have been completed in the pool and two, with initial productions of 2 to 8 barrels, on its edge. It now appears that the productive area will be confined to about 150 acres. Nine other wells were drilled in the township,

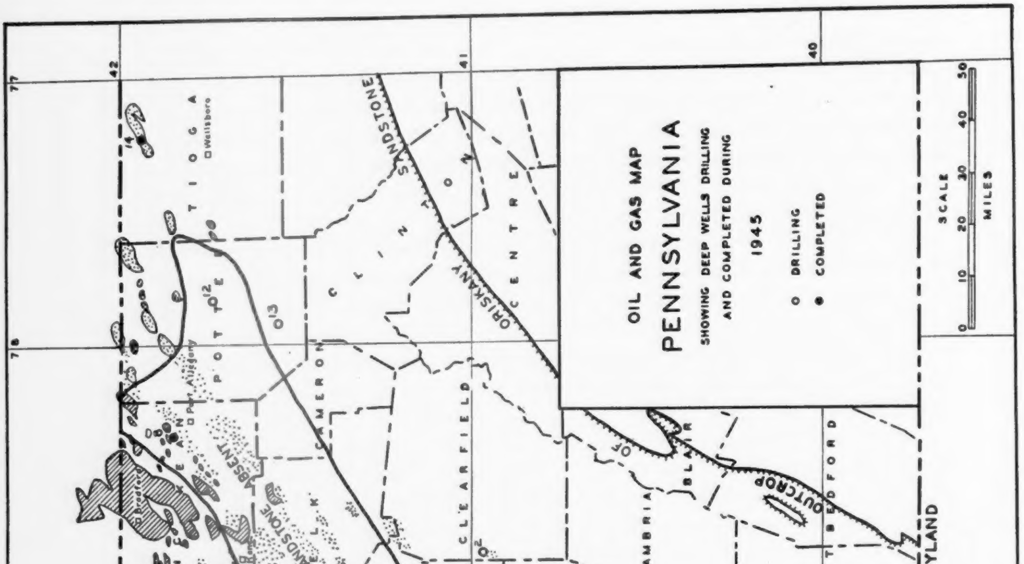
OIL AND GAS MAP
PENNSYLVANIA
SHOWING DEEP WELLS DRILLING AND COMPLETED DURING
1945
○ DRILLING
● COMPLETED
SCALE
0 10 20 30 40 50
MILES
OIL FIELD
SHALLOW SAND GAS FIELD
DEEP SAND GAS FIELD
LAKE ERIE
NEW YORK
OHIO
WEST VIRGINIA
MARYLAND
ORISKANY SANDSTONE ABSENT
ORISKANY SANDSTONE ABSENT
ORISKANY SANDSTONE
OUTCROP OF ORISKANY SANDSTONE

FIG. 2

five of which were gas wells producing from higher sands, including one with an initial open-flow capacity of $2\frac{1}{4}$ million cubic feet of gas per day; one, an oil well; and three dry holes.

Work on the experimental mine shaft with horizontal holes into the Venango First sand in the old Franklin heavy-oil pool at Franklin, Venango County, was stopped in 1945. Results were disappointing. Two holes had been drilled a distance of about 2,300 feet radially from the shaft and shot. Another pair was drilled 1,000 feet and a third pair, 500 and 700 feet, respectively, from the shaft. These had not been shot. One of the 1,000-foot holes and the 500- and 700-foot holes, which were inclined upward from the shaft, draining naturally, were producing about 25 barrels of oil per week during the summer of 1945. Under vacuum, it was possible to increase this to $37\frac{1}{2}$ barrels. The other holes were not producing.

DEEP-SAND DEVELOPMENTS

The results of deep drilling in western Pennsylvania during 1945 are summarized in Table IV. Of the eleven holes completed, none encountered commercial volumes of gas. One was drilled for gas storage purposes.

The C. R. Thornton well No. 1 in Harbor Creek Township, Erie County, represents an unsuccessful attempt to locate a stratigraphic trap-type gas pool in the Oriskany sandstone. The sandstone was absent. The J. R. Thompson Heirs No. 1 in Wharton Township, Fayette County, failed to locate a possible detached fault block southeast of the Summit gas pool. The Charles Nunn well No. 2 in Liberty Township, McKean County, represents a Medina test on the prominent dome occurring along the axis of the Smethport anticline at this locality. A previous test had shown the Oriskany sandstone to be absent. Both the Lockport dolomite and the Medina sandstone were proved to be dry. The Maude Davidson well No. 1 in Worth Township, Mercer County, was abandoned at the total depth of 8,892 feet after encountering salt water 40 feet in the Beekmantown dolomite. The Texas Company, after conducting rather extensive "seismic" surveys in southwestern Pennsylvania, drilled two Oriskany tests, the J. E. McCullough No. 1 in Cross Creek Township and the A. Skraba No. 1 in Robinson Township, Washington County, during 1945. Both encountered salt water in the Oriskany. The Camilla F. Giffin No. 2 in Fairfield Township, Westmoreland County, was abandoned above the Tully after crossing a fault zone on the southeast side of the elongate dome along the Chestnut Ridge anticline at this locality.

OHIO

The total completions in Ohio during 1945 were 1,034 which were six less than the figure for 1944. However, these figures, which approximate those for previous years during which markets were more normal, do not indicate a lack of interest or activity in the state. Many more tests would have been completed during 1945 had labor and materials been available.

FIG. 2

TABLE IV
DEEP TESTS COMPLETED AND DRILLING IN WESTERN PENNSYLVANIA IN 1945
(Depths are in feet)

Map No.	County	Township	Well	Company	Elevation above Sea-level	Berea	Tully	Top Onondaga
1	Beaver	South Beaver	C. C. Kennedy No. 1	Beaver Hill Oil & Gas Co.	1,240			
2	Clearfield	Bell	Alice Irwin No. 10	F. C. Deemer	1,964			
3	Elk	Highland	Warrant 3,653 No. 1	Pennsylvania Gas Company	1,572		5,141–5,177	5,560–
4	Erie	Harbor Creek	C. R. Thornton No. 1	Appalachian Dev. Corporation	1,070			1,926–
5	Erie	Greene	Alfred A. Holm No. 1	Appalachian Dev. Corporation	1,316			
6	Fayette	Wharton	J. R. Thompson Heirs No. 1	New Penn Dev. Corporation	2,316		6,930–	7,464– Top chert 7,491
7	Fayette	Georges	Wm. R. Barton No. 6	Manufacturers Light & Heat Co.	2,613		6,520–6,616	7,172– Top chert 7,200
8	McKean	Liberty	Charles Nunn No. 2	Allegany Gas Co.	1,488		3,935–3,950	4,550–
9	Mercer	Worth	Maude Davidson No. 1	United Natural Gas Company	1,420			4,043–
10	Mercer	Lake	J. Paul Miller No. 1	Mercer Oil & Gas Corporation	1,287			3,862–3,994
11	Mercer	West Salem	Herman Smith No. 1	Homer Hart and W. H. Hickman	1,272			
12	Potter	Ulysses	Lyman & Wynkoop No. 1	Sylvania Corp.	1,947		4,804–	5,486–
13	Potter	East Fork	Emporium Lumber Co. No. 9	Allegany Gas Co. et al.	1,996			
14	Tioga	Lawrence	Cleve S. Burtch No. 1	New York State Natural Gas Corp.	1,661		2,988–3,063	3,906–
15	Warren	Southwest	Reeves Farm No. 1	Northern Ordnance, Inc.	1,649		3,849–	4,125–
16	Washington	Cross Creek	J. E. McCullough No. 1	The Texas Company	1,258	1,995–	6,011–6,060	6,265
17	Washington	Robinson	A. Skraba No. 1	The Texas Company	1,133	1,693–		6,010–
18	Westmoreland	Fairfield	Camilla F. Giffin No. 2	The Peoples Natural Gas Company	2,261			
19	Westmoreland	Derry	Camilla F. Giffin No. 3	The Peoples Natural Gas Company	1,647			
20	Westmoreland	Unity	L. C. Steiner No. 1	American Locomotive Company	1,463			

TABLE IV (*continued*)

Oriskany	*Lockport*	*Medina*	*Top Trenton*	*Top Beekman-town Dolomite*	*Total Depth*	*Date Com-pleted*	*Results*
							Drilling at 250 feet
							Drilling at 6,054 feet
absent		7,340–7,530			7,546	7-19-45	Dry in Medina—completed as small shallow-sand gas well
absent					2,228	9- 7-45	Oriskany horizon at 2,185 feet—no sandstone. Salt water, 2,191–2,203 feet. Abandoned
							Drilling at 56 feet
7,638–					7,869	1-19-45	Dry—abandoned
							Drilling at 7,262 feet. 446 MCF gas at 7,218 and 7,260—7,262 feet
absent	5,880–6,060	6,426–6,563			6,615	9- 3-45	Oriskany horizon at 4,500 feet—no sandstone. Lockport and Medina dry. Completed as small shallow sand gas well
absent	5,200–5,456	absent	8,177–	8,834–	8,892	1-11-45	One foot glauconitic sandstone at Oriskany horizon, 4,171–4,172 feet 69 MCF, I.O.F. gas in Lockport at 5,399; 50 MCF I.O.F. gas in Trenton at 8,200; 118 MCF, I.O.F. at 8,582. Salt water in Beekmantown dolomite at 8,876–8,892 feet rose 1,200 feet on standing. Abandoned
3,994–4,022	4,985–5,183	5,400–5,573			5,586	10-23-45	Salt water in Oriskany rose 2,500 feet. 6½ MCF I.O.F. gas in Lockport at 5,069–5,071, more gas at 5,116–5,121 and black water. A little gas 5,456–5,486. Shot, 5,460–5,488; 75 MCF, I.O.F. after shot
							Drilling at 372 feet
absent							Oriskany horizon at 5,518—no sandstone. Drilling at 5,516 feet
							Spudding at 100 feet
3,942–					3,957	9-12-45	Drilled for gas storage
4,195–4,208	4,868–	5,369–5,575			5,595	7-12-45	½ bailer salt water per hour at 5,100 feet. Dry in Oriskany and Medina. Abandoned
6,473–					6,485	6-21-45	3 barrels salt water per hour at 6,479 feet. Abandoned
6,204–					6,244	8-22-45	17 MCF I.O.F. gas per 24 hours and 3½ bailers salt water per hour at 6,034 feet. At 6,213 feet salt water rose 1,600 feet in 24 hrs. Abandoned
					7,467	5- 1-45	Well abandoned above Tully limestone after crossing a fault zone
							Drilling at 5,850 feet
							Drilling at 1,563 feet

TABLE V

COMPLETIONS IN OHIO DURING 1945 BY COUNTIES AND SANDS

	Shallow			Berea			Ohio Shale			Oriskany			Newburg			Clinton			Trenton			Sub-Trenton			Total			Total Tests
	O	G	D	O	G	D	O	G	D	O	G	D	O	G	D	O	G	D	O	G	D	O	G	D	O	G	D	
Ashland				14	5	8								1			12	7							14	18	16	48
Ashtabula																	2	1								2	1	3
Athens	8	7	7		7	7												2							8	14	16	38
Beimont		1	2															1								1	3	4
Butler																				1						1		1
Carroll												1						1									2	2
Clermont																				1						1		1
Columbiana				1	2	4					13	5						4							1	15	3	29
Coshocton																3	5	12							3	5	12	20
Cuyahoga														1	1		3	1								4	2	6
Darke																			1						1			1
Fairfield													1			1	2	2							2	2	2	6
Gallia						1											3									3	1	4
Guernsey	2		1	1	4	6					3	3						1							3	7	11	21
Harrison																		1									1	1
Henry																					3						3	3
Hocking		2			4	2										2	2	3							2	8	5	15
Holmes					3									1		5	16	10							5	20	10	15
Jackson					1	1		1																		3	1	4
Jefferson		1				4																				1	4	5
Knox					1	1										3	8	11							3	9	12	24
Lawrence								1	1								3	1								4	2	6
Licking				7		1		1								1	4	4							8	5	5	18
Logan																				1						1		1
Lorain																1	36	27							1	36	27	64
Lucas																					1						1	1
Mahoning					1	1					1	6						1								2	8	10
Medina				3		1								1		1	27	21							4	8	22	54
Meigs		5	4	16	10	4																			16	15	8	39
Mercer																			2	1					2	1		3
Monroe	16	11	4		18	7																			16	29	11	56
Morgan	2	1	2		6	2		1									8	12							2	16	16	34
Muskingum						1				1						53	36	45							54	36	46	136
Noble	5	6	5	2	14	16																			7	20	21	48
Perry		1		4	1	10										29	21	21							33	23	31	87
Portage																	1	2								1	2	3
Putnam																			1						1			1
Richland																	1	3								1	3	4
Ross																								1			1	1
Sandusky																				1						1		1
Seneca																					2						2	2
Shelby																			1							1		1
Stark					1											1	35	10							1	36	10	47
Summit										1	5			1		1	2	5							2	8	5	15
Tuscarawas				1	8	6					2	1				1	14	7							2	24	14	40
Washington	28	20	17		3	4			3																28	23	24	75
Wayne																	5	10								5	10	15
Wood																					1						1	1
Totals	61	55	42	49	89	87			4	2	24	16	1	5	1	102	247	226	5	5	7			2	220	429	385	1,034

Due to increased activity in the Clinton oil fields in Perry and Muskingum counties, the number of oil-well completions were greater than at any time during the previous 4 years. However, less gas wells were drilled than during any of the previous 5 years. Of the 1,034 completions, 220, or 22 per cent, were oil wells, 429, or 42 per cent, were gas wells, and 385, or 36 per cent, were dry.

One hundred fifty-eight holes tested the shallow sands above the Berea, 225 were drilled through the Berea sand in the basal Mississippian, 8 penetrated the underlying Devonian Ohio shale, 42 were planned to test the Oriskany at the base of the Devonian, 7 reached the Newburg, an erratic porous zone marking the base of the Salina group, and 575, or 56 per cent of all holes drilled, penetrated the Clinton or underlying "Medina" sands, the Clinton being the most important producing formation in the state. Very little activity was reported in the Trenton fields of northwestern Ohio where only 5 oil wells, 5 gas wells, and 7 dry holes were drilled. A sub-Trenton test in Sullivan Township, Ashland County, gauged 220 MCF of gas in the lower Magnesian between 4,420 and 4,434 feet. Water was encountered at 4,537 and the hole was carried to 5,251 feet and abandoned. This encouraging showing will result in further tests to this formation. The only other sub-Trenton test, drilled in Ross County, was dry. However, further drilling may be undertaken in that vicinity as a result of favorable structural conditions indicated by the record of this hole.

The average initial daily production of oil wells for all sands was 23 barrels. The average open flow of gas wells for all sands was 819 MCF. These averages approximate those for previous years.

The most actively developed new field was in Columbiana and Mahoning counties where 14 gas wells and 11 dry holes were completed. The reservoir is in a stratigraphic trap along the western limits of the Oriskany sand. The discovery well gauged 6,000 MCF and had a closed pressure in excess of 1,300 pounds.

The completions in Ohio by sands and counties are given in Table V.

West Virginia

In the shallow-sand producing areas of the state there were only three completions which may be rated as new field discoveries. Two of these were in Logan County, one being in the Weir sand and one in the Berea sand, and each having open-flow volumes of less than ½ million cubic feet. The third was in Raleigh County and in the Weir sand, its volume being somewhat more than 2 million cubic feet.

In the Oriskany sand one new pool was discovered. It is located just northwest of Sandyville in Jackson County and west of the old area of Oriskany sand production. That it is a distinctly new pool is evidenced by the rock pressure, although the discovery well is less than 2 miles from the old and greatly depleted area.

The Oil and Gas Division of the State Department of Mines reports 1945 drilling activities with data practically complete as follows.

Total permits issued	824
Total new wells completed	665
Old wells drilled deeper	81
Gas wells	527
Oil wells	51
Combination oil and gas wells	14
Dry holes	154
Gas wells abandoned	457
Oil wells abandoned	107
Combination wells abandoned	8
Total wells abandoned	737

Of the gas wells completed, 163 did not report new volume developed, but those reporting showed a volume of 249,831,392 cubic feet. Oil wells reported new initial daily production of 777 barrels. Total footage drilled was 2,033,825 feet.

In comparison with 1944, there was a decrease of 195 in the number of drilling permits issued, or roughly 20 per cent. Total new wells completed decreased about 12 per cent. Other completion data changed little.

Gas wells abandoned increased considerably over the year 1944, while oil well abandonments decreased.

Aside from the Greenbrier lime drilling in Nicholas, Fayette, and adjoining counties and the Lime and Berea drilling in Wyoming County, the major part of the shallow sand drilling was on inside locations. Exploratory drilling still continues in the areas on the east and south and will probably spread farther southward in the near future.

During the year, drilling in Wyoming County was successful, a large part of the new gas production being from the Berea sand. This is an area of difficult drilling and is hard rock from the grass roots down. Production, all gas to date, is from the Maxton and Ravencliff sands at rather shallow depths, and from the Big lime and the Berea sand, this latter having total depths of some 3,000 to 3,500 feet. Earliest drilling dates back to the late 1920's, and development has been held back by distance from market and drilling costs.

Oriskany sand drilling has been a successful operation during the year. The Blue Creek pool in Kanawha County, discovered in 1944, now has 9 producing wells, 4 dry holes and 15 drilling operations, all of this drilling, except the discovery well, having occurred during 1945. The field is about 4½ miles east and west, and 1 mile north and south, in extent. Roughly 90 million cubic feet open flow of gas has been developed in the field so far. The rock pressure was originally about 1,900 pounds, this indicating no connection with the old field some 4 miles west.

The Sandyville extension, discovered in 1945, had at year's end 10 producing gas wells, no dry holes and 6 drilling operations. The total open flow developed was about 86 million cubic feet, and the original rock pressure was about 1,825 pounds. If the well now drilling just north of Ripley is a successful completion,

the pool may extend southward for 3 miles. The presently developed area is a circle about 2 miles in diameter.

What may be classed as outpost Oriskany sand dry holes in Jackson and Kanawha counties total six wells. Four of these are located in the area of the Blue Creek pool as already noted. One is in Boone County and one in Wayne County, this latter also testing the Big Six and Clinton sands. As purely wildcats, there were 5 additional Oriskany sand dry holes in Putnam, Boone, Wood, and Wayne counties.

The deep test, drilling at the end of 1944 in Tucker County, is still a drilling operation, but some gas has been developed in the shale above the Corniferous limestone, in the latter, and in the Oriskany sand. No information as to volume is available, but the indications are that it will be a gas well of perhaps small volume.

The wildcat well drilling in Pocahontas County at the end of 1944 was abandoned at a depth of 960 feet because of a constantly caving hole. The condition of these shallow formations is no doubt due to their abrupt folding and the difficulty could not be overcome with cable tools.

Eastern Kentucky

In eastern Kentucky during 1945 the Big Sandy gas field still remains the most important for that part of the state. In this large gas-proved field located in Floyd, Pike, Knott, Martin, eastern Magoffin, and southern Johnson counties, and covering an area of approximately 650,000 acres, 221 wells developing 123,203,000 cubic feet, were drilled during 1945.

In this proved area, which is now 70 per cent developed, 3,723 wells have been drilled for gas of which only 400 are dry holes. The average open flow per well including dry holes is 614,000 cubic feet per well and production is encountered from the various sands in descending order as follows.

		Percentage
Pennsylvanian	Salt sands	6.3
Mississippian	Maxon (Mauch Chunk)	10.7
	Big lime and Injun	6.8
	Weir	.3
	Berea	.2
Devonian	Black shale	61.8
	Corniferous	1.4
Silurian	"Big 6"	1.9
	Dry	10.9
		100.0

Of the total open flow developed only 24.6 per cent comes from the Devonian shales, but with their great thickness and long life the Black Carbonaceous shale of Devonian age are responsible for 80 per cent of total gas recovered from the Big Sandy gas fields.

The most important wildcat drilled in eastern Kentucky was by a major oil

company near Hyden in Leslie County, Kentucky. This well was drilled to the total depth of 2,796 feet and encountered 133,000 cubic feet of gas in the "Big 6" sand of Clinton, Silurian age. The closest production is 17 miles northwest in the Oneida, Clay County, field which produced from the same formation. During 1945 eight gas wells with an average open flow of more than ½ million cubic feet were drilled in the Oneida field.

Kentucky for the first time in its oil history passed the 10 million-barrel mark by producing 10,019,641 barrels. Although western Kentucky is responsible for 8,262,516 barrels of the total, to Union County goes the greatest credit with 4,056,142 barrels, or 40 per cent of oil produced in the Commonwealth.

The only new oil development in eastern Kentucky was the extension of small pools in Burke Dome pool of Elliott County, Indian Creek pool of Menifee, and the McKee pool of Jackson County. Not over 20 producing oil wells with a daily production of 150 barrels were drilled.

Tennessee East of Cincinnati Arch

Oil production in 1945 in Tennessee east of the Cincinnati arch was slightly more than 6,000 barrels, most of which came from the Mississippian limestone in Scott and Morgan counties. Thirty million cubic feet of gas was marketed off the lease in Morgan County and about 10 million cubic feet was produced in the Jamestown field in Fentress County.

There were five completions during the year and all were dry holes. The most significant test, drilled in Cumberland County, was abandoned at 3,707 feet. A small showing of oil was found at 3,429–3,435 feet, 79 feet below the top of the Knox dolomite group.

There was considerable amount of leasing in the Mississippi Embayment area in western Tennessee late in the year.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
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DEVELOPMENTS IN EASTERN INTERIOR BASIN IN 1945[1]

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ABSTRACT

Drilling in the Eastern Interior basin decreased 15 per cent and production decreased 2½ per cent in 1945. The removal of well-spacing restrictions by the Federal Government about September 1 did not result in any noticeable increase in drilling. There was little deep testing in 1945, and nearly all of the new wells produced from sandstones and limestones of the Mississippian system.

Production in Kentucky reached a new high of slightly more than 10 million barrels.

Drilling is expected to continue in 1946 at nearly the same rate as in 1945, with possibly an increase in wildcat testing due to the expiration of a large acreage of 10-year leases in the Illinois basin.

INTRODUCTION

Drilling in the Eastern Interior basin decreased by 15 per cent in 1945 as compared with 1944. The removal of well-spacing restrictions by the Federal Government about September 1 did not result in any noticeable increase in drilling. Forty-six new pools were discovered, all of them small. Total production in 1945 was approximately 88 million barrels, which amounted to 5.1 per cent of the total for the United States.

Total production in Illinois was 75,210,000 barrels of oil, of which it is estimated that 90 per cent came from Mississippian strata, a little less than 4 per cent each came from Pennsylvanian and Devonian strata, and a little more than 1 per cent each from Silurian and Ordovician strata.

Production in both western Kentucky and southwestern Indiana came dominantly from the Mississippian system.

DEVELOPMENT

Approximately 2,538 wells were drilled for oil or gas in the Eastern Interior basin in 1945 as compared with 2,967 in 1944, a decrease of 15 per cent. The following table shows the distribution by states.

NUMBER OF COMPLETED WELLS
(Excluding water and gas input wells, salt-water disposal wells and old wells worked over)

	1944	*1945*
Illinois	1,991	1,761
Southwestern Indiana	276	259
Western Kentucky	700	518
	2,967	2,538

NEW POOLS DISCOVERED

As shown in Table I, 46 new pools were discovered in 1945 in the Eastern

[1] Published with the permission of the chief of the Illinois State Geological Survey, Urbana. Manuscript received, March 23, 1946. Presented by title before the Association at Chicago, April 2–4, 1946.

[2] Geologist and head, Oil and Gas Division, Illinois State Geological Survey.

TABLE I

POOLS DISCOVERED IN EASTERN INTERIOR BASIN IN 1945

Pool	County	Company and Farm	Location	Total Depth (Feet)	Depth to Top (Feet)	Producing Formation	Initial Production (Barrels)[a]	Date of Completion	No. of Wells Producing in Pool Dec. 27, 1945
ILLINOIS									
1. Aden South	Hamilton	Rudy, Marlow 1	29-3S-7E	3,430	3,384	McClosky	25+9	7/24/45	1
2. Bartelso W.	Clinton	Mosebach, J. Meyers 1	18-1N-3W	976	933	Cypress	6+2	10/30/45	1
3. Brownsville	White	H. H. Weinert, Kisner 1	31-5S-9E	3,186	3,118; 3,139	Rosiclare; McClosky	187	3/13/45	32
4. Gallagher	Richland	Pure, J. C. Howard A-1	13-2N-9E	3,243	3,167	McClosky	96+81	10/16/45	1
5. Goldengate N.	Wayne	Dell & Duncan, T. A. Leach 1	9-2S-9E	3,407	3,303; 3,329	Lower O'Hara Rosiclare	122	11/ 6/45	2
6. Huey	Clinton	Goldschmidt & Schierman, Jentzen 1	32-2N-2W	1,266	1,250	Bethel	26+2	8/14/45	3
7. Hunt City	Jasper	W. W. Shaffer, M. Stifel 1	2-7N-10E	2,715	2,542	Rosiclare	25+10	9/25/45	1
8. Ingraham W.	Clay	Kingwood, Fulk 1	13-5N-7E	2,577	2,532	Cypress	52+67	8/21/45	2
9. Iola W.	Clay	Texas, Wyette Jones 1	18-5N-4E	2,505	2,494	McClosky	12+8	1/16/45	0
10. Keenville	Wayne	Gulf, M. Anderson 1	26-1S-5E	3,158	2,998	Aux Vases	11+240	2/ 5/45	1
11. Maplegrove S.	Edwards	Aetna & Hayes, C. Greathouse 1	23-1N-10E	3,320	3,244	Lower O'Hara	80	3/20/45	1
12. Markham City W.	Jefferson	Gulf, F. W. Purcell 1	4-3S-4E	3,165	2,913	Aux Vases	27+120	11/13/45	1
13. Maunie West	White	B. M. Heath, North Storms 1	2-6S-10E	3,149	3,038	McClosky	38+4	7/17/45	1
14. Newton North	Jasper	Shulman Bros., Ben Bunton 1	31-7N-10E	2,863	2,856	McClosky	37+30	11/27/45	1
15. Odin	Marion	Buell & Doran, M. J. Young 1	12-2N-1E	1,760	1,750	Cypress	125	5/29/45	21
16. Parkersburg N.	Richland	Cent. Pipe Line, Lee Bunn 1	28-3N-14W	3,132	3,078	McClosky	48+30	10/30/45	1
17. Passport	Clay	Magnolia, F. Stanley 1	12-4N-8E	3,005	3,003	Rosiclare	326	3/13/45	4
18. Rural Hill W.	Hamilton	Tide Water, W. B. Johnson 1	33-6S-5E	3,483	3,229	Aux Vases	33+30	6/19/45	1
19. Samsville N.	Edwards	Cent. Pipe Line, Ch. Obold 1	30-1N-14W	2,890	2,882	Bethel	91+25	10/ 2/45	2
20. Seminary	Richland	H. W. Carter, D. C. Borah 1	20-2N-10E	3,202	3,199	McClosky	224	6/25/45	2
21. Shattuc	Clinton	Murphy & Conrey, L. Noller 1	28-2N-1W	1,286	1,279	Cypress	25	6/12/45	2
22. Shawneetown	Gallatin	Ferral, C. I. Oldham, 1	24-9S-9E	2,837	2,648	Aux Vases	19+6	9/11/45	1
23. Springerton	Hamilton	Carter Oil, Prov. Mut. Ins. 1-A	14-4S-7E	3,327	3,293	Aux Vases	137	9/ 4/45	3
24. Stanford	Clay	Pure & Lynn, J. Goings 1	24-3N-7E	3,036	3,028	McClosky	888	10/ 2/45	9
25. Sumpter	White	Lario, E. Organ 1	35-4S-9E	3,379	2,569	Tar Springs	33+38	11/13/45	1
26. Willow Hill N.	Jasper	Robinson & Puckett, Roberts 1	26-7N-10E	2,660	2,599	McClosky	180	5/15/45	2
INDIANA									
27. Crunk	Posey	W. Duncan, A. Meinschein 1	16-7S-12W	2,712	2,705	McClosky	48		1
28. Farmersville	Posey	Central States, E. Blackburn 1-A	20-6S-13W	1,107	1,102	Mansfield	1	Jan.	4
29. French	Spencer	F. H. Rhodes, Montgomery-Eagley 1	30-7S-7W	1,160	1,148	Tar Springs	1,118 MCFG	Oct.	1
30. Jeffries	Posey	Carter Oil, A. S. Cox 1	14-7S-14W	2,092	2,073	Tar Springs	105+13	July	4
31. Johnson W.	Gibson	Magnolia, E. L. Dike 1	25-2S-13W	2,695 PB 2,827	2,655	Aux Vases	128		1
32. Lysle	Gibson	Deep Vein Coal, Fee 1	1-2S-12W	2,138	2,124	Bethel	172		1
33. Mt. Carmel E.	Gibson	Ryan Oil, F. G. Putnam 1	26-1S-12W	1,796	1,790	Hardinsburg	23		3
34. Oliver	Posey	J. T. Peek, A. Reineke 1	12-6S-13W	780	722	Penn.	1,650 MCFG	June	1
35. St. Wendell E.	Posey	B. Hackbush, H. Goedde 1	24-5S-12W	2,372 PB 2,820	2,368	Weiler	10+50		1
KENTUCKY									
36. Anthosten	Henderson	Ryan Oil Co., Crafton 1	9-O-24	2,046	2,025	Jackson	15	Dec.	
37. Beaver Pond	Daviess	Snyder & Slaughter, Hollis 1	9-Q-30	830	820	Tar Springs	8	June	
38. Corydon East	Henderson	Fleming-Swann, Patterson 1	1-O-22	2,272	2,265	Cyress	125	May	
39. Dixie	Henderson	Salee Bros. et al., Liles 1	21-O-22	2,301	2,289	Cypress	375	May	
40. Elkton	Todd	Hobson-Putnam, Stinson 1	8-D-29	1,392	1,389	Devonian	4	August	
41. Henderson	Henderson	Basin Drlg. Co., Kasey Bros. 1	8-P-23	2,448	2,440	McClosky	370	Dec.	
42. Piney	Crittenden	J. Resnik, Woodall 1	7-K-20	1,400	1,389	Benoist	30	Sept.	
43. Robinsville	Union	J. Engberg, Blake 1	22-P-20						
44. Uniontown E.	Union	Ryan Oil Co., Greenwell 1	17-P-20	2,350	2,339	Cypress	210	Oct.	
45. Waverly	Union	Ashland, Verona Coal "A" 1	7-O-21	2,287	2,283	Cypress	130	May	
46. Unnamed (shut in gas well)	Daviess	Sohio, Sauer 1	17-P-27	1,131	1,122	Waltersburg	591,000 cu. ft.	Sept.	

[a] Oil and water.

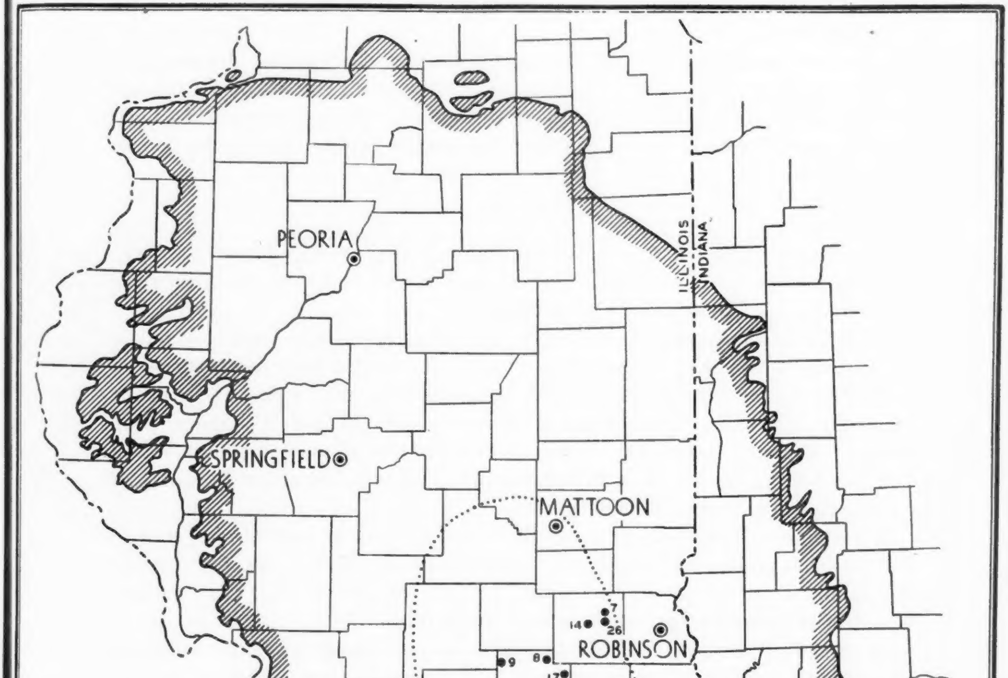

FIG. 1.—Map of Eastern Interior basin showing new oil pools discovered in 1945. For list of pools see Table I.

ª Oil and water.

Interior basin. Of these new pools, 26 are in Illinois, 9 are in Indiana, and 11 are in Kentucky.

The most noteworthy of the Illinois pools discovered in 1945 are: Brownsville, White County, with 32 wells and a total production to the end of 1945 of 205,000 barrels; Odin, Marion County, with 21 wells and a total production of 84,000 barrels; and Stanford, Clay County, with 9 wells and a total production of 105,000 barrels.

ILLINOIS

All of the new pool discovery wells in Illinois in 1945 produced from Mississippian formations, 12 in Chester series sandstones, and 14 in the Ste. Genevieve formation of the Lower Mississippian series.

New producing formations.—Additional producing formations discovered in Illinois oil pools in 1945 numbered 26, of which 11 were in the Chester series, 14 in the Ste. Genevieve formation of the Lower Mississippian series, and 1 in the Devonian limestone. The Devonian discovery was in the Woodlawn pool, Jefferson County. It was The Texas Company's E. Eubanks Community well No. 1 in Sec. 35, T. 2 S., R. 1 E., total depth 3,746 feet, top of the Devonian at 3,663 feet, initial production 65 barrels of oil.

Extensions.—Extensions to pools discovered by outpost wells (from $\frac{1}{4}$ mile to 2 miles from production) in Illinois numbered 47, of which 1 was in the Pennsylvanian, 16 were in the Chester series, 23 in the Ste. Genevieve, 5 in combinations of Chester and Ste. Genevieve, and 2 in Silurian.

Exploratory methods and results.—Subsurface geology and the reflection seismograph continue to be the methods most used in the location of exploratory wells. Of the 26 pools discovered in 1945, the discovery wells of 19 were located on the basis of geology, 4 on a combination of seismograph and geology, 1 on seismograph, and 2 not on any scientific basis.

The only kind of geophysical work reported to have been done in Illinois in 1945 was refection seismograph, the total amount of which declined from 33 party-months in 1944 to 25 party-months in 1945, a decline of about 24 per cent.

Wildcat drilling.—The total number of wildcat completions in Illinois increased from 441 in 1944 to 460 in 1945, an increase of 5 per cent. Of the total, 73 or 16 per cent were successful in obtaining production.

Of the 460 wildcat wells completed in 1945, 232 were located more than 2 miles from production as compared with 261 in 1944. Of the 232 wildcats, 26 or 11 per cent were successful, the same percentage as in 1944.

Deep testing.—There was little deep testing in Illinois in 1945. In the Illinois basin (central deeper part of the Eastern Interior basin) only 1 test was drilled below the Mississippian, namely, the well which discovered Devonian production in the Woodlawn pool, Jefferson County.

Pool development drilling.—The pools which had the most producing wells added during 1945 were: Clay City Consolidated, Clay and Wayne counties, 112

wells added; Boyd, Jefferson County, 77 wells added: Mattoon, Coles County, 61 wells added; Albion Consolidated, Edwards County, 54 wells added; Bible Grove, Clay, and Effingham counties, 53 wells added.

Most of the drilling in Illinois was in the deep basin area, especially in the following ten counties: Clay, Coles, Edwards, Effingham, Hamilton, Jefferson, Richland, Wabash, Wayne, and White. White ranked first with 230 completions of which 159 were producing wells.

An outstanding feature of 1945 development was the growth of the Mattoon pool, Coles County, in the latter part of the year. This pool was discovered in 1939, but to the end of 1944 it had only 12 producing wells. The successful completion of a wildcat well in July of 1945 extended the pool 2 miles southwest and started an active drilling campaign. There were extensions toward the north, west, and south until by the end of 1945 the pool was 8 miles long north and south, and about 2 miles wide at the widest part. At the end of 1945 there were 68 wells in the Mattoon pool with a total daily yield of about 6,500 barrels of oil, and there were about 100 drilling wells in the area or about one third of the total drilling in the state. Production is mainly from the Rosiclare sandstone member of the Ste. Genevieve formation and the Cypress sandstone.

TABLE II

SELECTED LIST OF MOST NOTEWORTHY DRY TESTS IN ILLINOIS IN 1945

Pool	County	Company and Farm	Location	Total Depth	Deepest Formation	Depth to Top	Date of Completion
1.	Clark	Loyd, Bays 1	21-11N-12W	2,432	Devonian	2,376	4-24-45
2. Huey	Clinton	Mosebach, Jentzen 1	29-2N-2W	2,720	Devonian	2,685	10-2-45
3.	Clinton	Big Chief, Gieseke 1	9-2N-5W	2,942	Plattin	2,866	8-7-45
4.	Hancock	Heavener, Broadhead 1	14-5N-5W	1,090	St. Peter	941	6-26-45
5. Collinsville	Madison	Benoist, Keller 4	8-3N-8W	2,195	St. Peter	2,177	1-9-45
6.	Madison	Eason, Albrecht 1	20-5N-5W	2,719	Trenton	2,618	10-9-45
7.	Tazewell	Guengerich, Mathis 2	24-25N-3W	2,235	Shakopee	2,210	11-20-45
8.	Union	Mims, Potashnick 1	26-13S-3W	1,525	Joachim	?	11-20-45
9. Cordes	Washington	Shell, Sharkowski 13-D	23-3S-3W	2,887	Devonian	2,735	12-18-45
10.	Washington	Inland Oil, Lichtenfels 1	22-1S-3W	2,808	Devonian	2,734	9-4-45

The development of the Mattoon pool has led to increased interest in the possibilities of the northern part of the Illinois basin which has had relatively few wildcat tests as compared with the southern part. As a result Coles, Cumberland, Shelby, Moultrie, and some adjacent counties will probably have increased exploratory drilling in 1946.

Drilling is expected to continue through 1946 at about the same rate as in 1945. The expiration during the year of a large acreage of 10-year leases in the Illinois basin will probably result in increased wildcat testing.

SOUTHWESTERN INDIANA

The following statement on southwestern Indiana was furnished by R. E. Esarey, professor of geology, Indiana University, Bloomington, Indiana.

The most important discoveries in southwestern Indiana during the year 1945

were made in western Gibson County (Table I, Nos. 31, 32, 33). One of these, the Lysle pool, opened by the Deep Vein Coal Company's Fee 1, might develop into a major pool. In addition to the present producing sands, other Chester beds and the Ste. Genevieve may be saturated. The entire area is under lease and will be thoroughly tested during the coming drilling season.

Extensions to several of the old pools in northeastern Gibson County have been made with the finding of saturation in both shallower and deeper beds. Most of the wells were small producers, but the Shoultz well of the Chester Oil Company had an initial production of 250 barrels. There is continued activity in this area.

New producing beds were found in the Jeffries pool in Posey County, which will add materially to that county's total production. Mink Island and Point Township have had several good completions during the year. Knox County is being prospected more thoroughly (core-drilling and slim-hole testing) but only a few locations have been made. Extensions to the St. Thomas and St. Francisville pools look encouraging, but the areas are not sufficiently developed to make satisfactory evaluations.

Some prospecting for Devonian production by coring and geophysical work is being carried on in Sullivan and Vigo counties. However, no leasing or testing is known to have started yet.

An interesting deep test[3] was R. D. Brown's Ada Bingham No. 1, Sec. 16, T. 1 S., R. 11 W., in the abandoned Patoka pool, Gibson County, Indiana, total depth 6,198 feet, completed in December, 1945. It was abandoned with a hole full of sulphur water after penetrating the St. Peter sandstone for 118 feet.

WESTERN KENTUCKY

The following statement regarding developments in Kentucky in 1945 was furnished by D. J. Jones, State geologist, Lexington, Kentucky.

Preliminary figures for 1945 indicate that Kentucky oil production slightly exceeded 10,000,000 barrels, and for the second year in succession has topped all previous records.

Since the close of the war the number of exploratory wells has fallen off, and the total number drilled in western Kentucky in 1945 was slightly more than 500 as compared with 700 for the previous year. The decrease in wildcat tests is especially evident in the counties where there is little or no production, in spite of the fact that a number of them may become important producers. This observation applies particularly to those counties in the southern part of the basin.

Continued development in Henderson, Union, and Webster counties has been responsible for a very large percentage of the increase in production, and a total of 323 wells were drilled in these counties.

Production has been developed from eleven formations, ranging from basal

[3] *Oil and Gas Jour.*, Vol. 44, No. 41 (February 16, 1946), p. 111.

Pottsville to the "Corniferous." A small well producing from the "Corniferous" was reported from Todd County. This outpost should stimulate Devonian testing throughout much of this part of the basin.

The formations furnishing the greater part of the new production were the Palestine, Tar Springs, Hardinsburg, Cypress, Bethel, and the McClosky. A summary of drilling operations reveals that out of a total initial production of approximately 30,000 barrels, a total of 28,900 barrels was produced from these formations.

Five tests penetrated beds of Ordovician age, none of which was productive.

Ten new pools were developed during the year.

Daily production for the month of December, 1945, averaged approximately 29,400 barrels as compared with 29,000 for the same month of 1944. This indicates the probability that 1946 production figures will exceed those of 1945.

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VOL. 30, NO. 6 (JUNE, 1946), PP. 886-894, 1 FIG.

DEVELOPMENTS IN MICHIGAN IN 1945[1]

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ABSTRACT

During 1945, 302 wildcat wells were drilled in Michigan, resulting in the discovery of 14 oil fields 8 gas fields, and new pay zones in 6 old fields, and in the extension of 2 oil fields and one gas field. Despite the comparatively large number of discoveries, only small oil and gas reserves were added.

In the past year, 755 drilling permits were issued, only 14 more than in 1944. Eight hundred and one wells were completed, compared with the 710 wells completed in 1944; 41 per cent of the wells drilled were productive. Average initial production was 928 barrels per well. Total footage drilled was 2,005,044, approximately 350,000 feet more than in 1944.

Oil production continued to decline for the third successive year and decreased almost 7 per cent from the 17,267,493 barrels produced in 1944. Gas production, however, continued to climb and reached a new high of 23,298,548,000 cubic feet, approximately 10 per cent more than in 1944.

Core-testing activity continued at approximately the same rate as during 1944. Two hundred and three permits were issued.

INTRODUCTION

Petroleum development in Michigan in 1945, on the basis of permits issued, wells completed, and footage drilled, showed a slight increase over 1944. During the year 755 permits were issued, 801 wells were completed, and 2,005,044 feet drilled, compared with 741 permits, 710 completions, and 1,655,240 footage drilled in 1944. Of the 801 well completions, 334 are oil or gas wells, a success rate of 41 per cent, compared with 44 per cent in 1944.

Wildcat well completions increased to 302 in 1945 from the 269 of 1944. Fourteen oil fields and eight gas fields were discovered, new pay zones were found in six old fields, and three fields were extended.

TABLE I

SUMMARY OF OPERATIONS, BY DISTRICTS, IN MICHIGAN DURING 1945

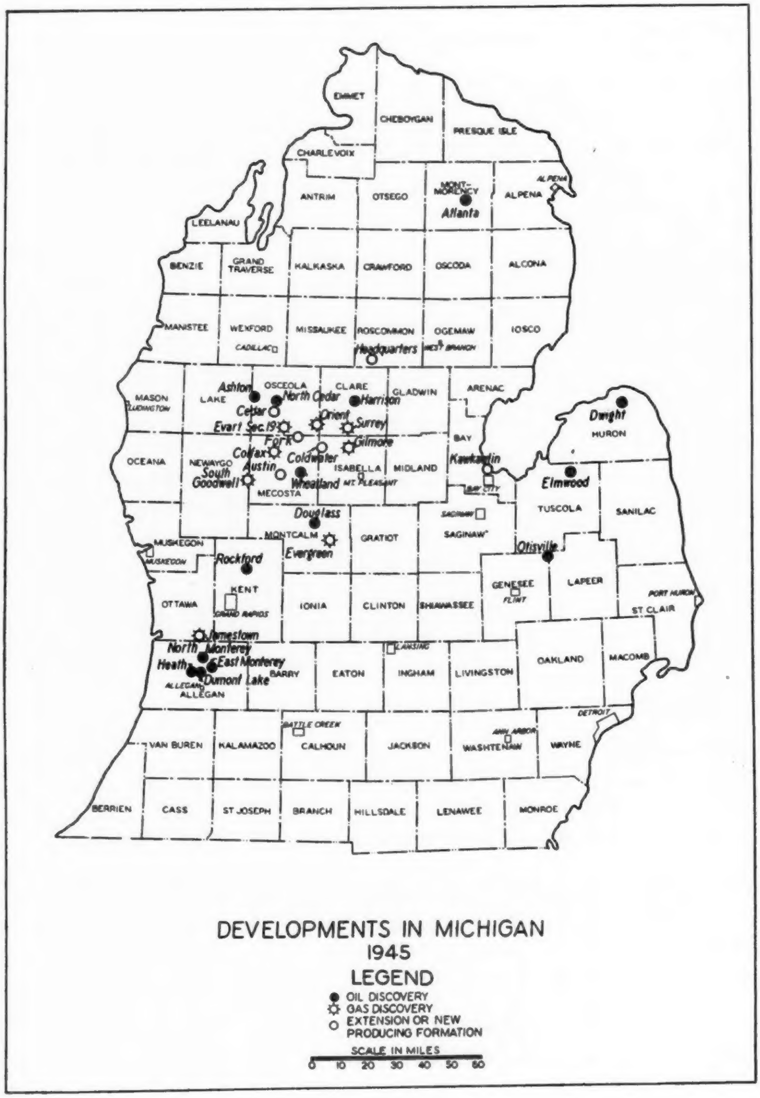
District	*Permits Issued*	*Wells Completed*	*Oil Wells*	*Initial Production Oil (Barrels)*	*Gas Wells*	*Initial Production Gas (1,000 Cu. Ft.)*	*Dry Holes*	*Total Production 1945*	
								Oil (Barrels)	*Gas (1,000 Cu. Ft.)*
SW. Michigan	210	225	60	3,381	2	1,025	163	1,402,303	82,584
Basin	508	540	209	244,563	61	397,128	270	15,836,729	23,215,964
All other parts of state	37	36	2	25			34	28,461	
Totals	755	801	271	247,969	63	398,153	467	17,267,493	23,298,548

OIL

Activity in oil operations continued to be concentrated in the "Basin" district for which two thirds of the permits were issued. Two thirds of the completed

[1] Manuscript received, March 18, 1946. Presented by title before the Association at Chicago, April 2-4, 1946.

[2] Assistant petroleum geologist, Michigan Department of Conservation, Geological Survey Division.


EMMET
CHEBOYGAN
PRESQUE ISLE
CHARLEVOIX
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OTSEGO
MONT-MORENCY
Atlanta
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
CADILLAC
MISSAUKEE
ROSCOMMON
Headquarters
OGEMAW
WEST BRANCH
IOSCO
MASON
LUDINGTON
LAKE
Ashton
OSCEOLA
North Cedar
Cedar
CLARE
Harrison
GLADWIN
ARENAC
Evart Sec.19
Orient
Surrey
Fork
Colfax
Coldwater
Gilmore
Austin
OCEANA
NEWAYGO
South Goodwell
MECOSTA
Wheatland
ISABELLA
MT. PLEASANT
MIDLAND
BAY
Kawkawlin
BAY CITY
Dwight
HURON
Elmwood
TUSCOLA
SANILAC
Douglass
MONTCALM
Evergreen
GRATIOT
SAGINAW
MUSKEGON
Rockford
Otisville
KENT
GRAND RAPIDS
OTTAWA
IONIA
CLINTON
SHIAWASSEE
GENESEE
FLINT
LAPEER
PORT HURON
ST. CLAIR
Jamestown
North Monterey
East Monterey
Heath
Dumont Lake
ALLEGAN
BARRY
EATON
LANSING
INGHAM
LIVINGSTON
OAKLAND
MACOMB
DETROIT
VAN BUREN
KALAMAZOO
BATTLE CREEK
CALHOUN
JACKSON
ANN ARBOR
WASHTENAW
WAYNE
BERRIEN
CASS
ST. JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
DEVELOPMENTS IN MICHIGAN
1945
LEGEND
OIL DISCOVERY
GAS DISCOVERY
EXTENSION OR NEW PRODUCING FORMATION
SCALE IN MILES
0 10 20 30 40 50 60

FIG. 1

TABLE II

FIELDS, NEW PRODUCING FORMATIONS, AND EXTENSIONS DISCOVERED IN 1945

County	Field	Section Township Range	Operator	Well	Permit Number	Month and Day 1945	Total Depth (Feet)	Initial Production: Oil (Barrels)	Initial Production: Gas (1,000 Cu. Ft.)	Formation	Method of Location*	Number of Wells Jan. 1, 1946
				New Fields								
Allegan	Dumont Lake	32-3N-13W	Charles W. Cook	Boyer 1	11,657	8-2	1,480	16 per 5 hrs.		Traverse	G	1
Allegan	East Monterey	24-3N-13W	H. C. Williams	Kern 1	11,191	1-25	1,661	10 per hr.		Traverse	G	1
Allegan	Heath	35-3N-14W	S. L. McCall	Erwin 1	11,661	7-19	1,470	20		Traverse	G	1
Allegan	North Monterey	4-3N-13W	R. B. Tamblyn Dev. Co.	Brown 1	11,918	12-9	1,674	25		Traverse	G	1
Clare	Harrison	7-18N-4W	Pure Oil Co.	Powell 1	11,323	7-24	4,348 pb 4,223	96		Dundee	C	1
Clare	Surrey	23-17N-5W	Michigan Consol. Gas Co.	Frizzell 1	11,435	4-21	1,470 pb 1,464		475	"Mich. Stray"	G	1
Genesee	Otisville	12-9N-8E	Hugh Heinig	Elliott 1	11,628	7-11	1,506	6		Berea	G	1
Huron	Dwight	21-18N-13E	Charles W. Teater	Ignash 1	11,256	2-15	2,878 pb 2,874	20		Detroit River	G	1
Isabella	Gilmore	26-16N-5W	Sohio Petroleum Co.	Gilmore Gas Unit 2	11,855	10-26	1,569 pb 1,563		1,710	"Mich. Stray"	C	2
Kent	Rockford	25-9N-11W	S. L. McCall	Hutchins & Wolven 1	11,440	5-17	2,214 pb 2,204	60		Traverse	G	3
Mecosta	Colfax	4-15N-9W	Michigan Consol. Gas Co.	Bush 1	11,419	4-14	1,302		9,280	"Mich. Stray"	C	4
Mecosta	Wheatland	7-14N-7W	Smith Petroleum Co.	Ortwein 1	11,305	4-6	3,687	51		Dundee	G	0
Montcalm	Douglass	1-11N-7W	J. A. B. Oil Co.	Gyger-Barber-State 1	11,607	9-14	3,397	186		Dundee	G	3
Montcalm	Evergreen	2-10N-6W	Allegan Pipe & Supply Co.	Keeler 1	11,514	5-21	1,158		65	"Mich. Stray"	G	1
Montmorency	Atlanta	10-30N-3E	E. R. Morris	Patterson & White 1	11,385	6-15	2,510 pb 1,215	5		Detroit River	T	1
Newaygo	South Goodwell	24-14N-11W	Taggart Bros. Gas Co.	Helems 1	11,973	11-28	1,201 pb 1,196		613	"Mich. Stray"	C	1
Osceola	Ashton	5-18N-10W	Lupher Drilling Co.	Kessinger 1	11,610	8-6	2,948	500 per 17½ hrs.		Traverse	G	1
Osceola	Evart-Sec. 19	19-17N-8W	Sun Oil Co.	Boyd & Jaguszewski 1	11,902	10-16	1,492		150	"Mich. Stray"	C	1
Osceola	North Cedar	10-18N-9W	Sun Oil Co.	State Cedar B-1	11,172	3-5	4,077 pb 3,952	15		Dundee	G	0
Osceola	Orient	13-17N-7W	Sohio Petroleum Co.	Orient Gas Unit 1	11,948	11-12	1,516		1,940	"Mich. Stray"	C	1
Ottawa	Jamestown	29-5N-13W	Clawson Dev. Co.	Van Bronkhorst 1	11,809	10-13	1,645 pb 940		800	"Berea"	G	1
Tuscola	Elmwood	21-14N-10E	Shell Oil Co.	Hutchinson 1	11,346	3-9	3,945 pb 2,860	3		Dundee	S	1
				New Producing Formations								
Clare	Harrison	7-18N-4W	Taggart Bros. Gas Co.	Sanford-Root 2	11,729	8-17	1,659		10,350	"Mich. Stray"		2
Isabella	Coldwater	29-16N-6W	Sohio Petroleum Co.	Gas Unit 1	11,443	4-26	1,404		8,400	"Mich. Stray"		8
Mecosta	Fork	2-16N-8W	Sun Oil Co.	Denslow 1	11,075	1-14	5,198 pb 5,084	14	3,365	Detroit River		1
Osceola	Ashton	5-18N-10W	Pure Oil Co.	Carr 1	11,806	11-17	3,676 pb 3,659	22		Detroit River		1
Osceola	Cedar	28-18-9W	Ohio Oil Co.	Boettcher 1	10,005	5-24	5,160	90		Detroit River		1
Osceola	Cedar	28-18N-9W	Ashby Drilling Co.	Boettcher 1	11,836	10-31	1,560		681	"Mich. Stray"		1
				Field Extensions								
Bay	Kawkawlin	9-14N-5E	Gulf Refining Co.	Douviec 1	11,703	9-18	2,924 pb 2,919	23		Dundee		
Mecosta	Austin	12-14N-9W	W. Mich. Consumers Co.	State-McKrill 1	12,007	12-22	1,378		5,000	"Mich. Stray"		
Roscommon	Headquarters	19-21N-3W	Eugene Hilliard	State-Roscommon D-1	11,666	9-23	3,185	65		Traverse		

* G—Subsurface Geology
T—Trend
C—Core Drilling
S—Seismograph

wells and four fifths of the new oil and gas wells are in the "Basin," and it produced nine tenths of Michigan's 1945 oil. Distribution of wells and analysis of data are shown in Table I. Oil production in 1945 was 17,267,493 barrels, compared with 18,489,470 barrels in 1944.

According to figures announced by the American Petroleum Institute in the *Oil and Gas Journal* of February 11, 1946. Michigan developed 40,240,000 barrels of new reserves in 1945. All except 4,000,000 barrels of this, however, was credited to the revision of previous estimates and the extension of known fields.

DISCOVERIES

Although 14 oil fields were discovered during 1945, none of them, on the basis of data available at the end of the year, appears to be of major importance at the close of 1945. Ten of the new pools are one-well pools, one field has two wells, and one has three wells, whereas two of the discoveries were abandoned.

In the "Basin," Douglass, Montcalm County, and Ashton, Osceola County, appear to be the most promising of the new fields, whereas in southwestern Michigan, the Rockford field, Kent County, seems to be the only one of any importance in the district.

The discovery of new pay zones in the Fork field, Mecosta County, and Cedar field, Osceola County, is one of the few bright spots in 1945 developments. Deep tests in these fields found oil in the "Richfield" zone of the Detroit River formation (Devonian), and greatly increased the area of the state known to have commercial oil in this zone. Existence of commercial oil had previously been established in Arenac, Clare, Missaukee, and Ogemaw counties.

Oil in the "Richfield" was discovered in the Fork field by the Sun Oil Company in Denslow No. 1, Sec. 2, T. 16 N., R. 8 W., Mecosta County. The well was completed at a plug-back depth of 5,084 feet, approximately 1,000 feet below the top of the Detroit River formation. Initial production was 3,365,000 cubic feet of gas and 14 barrels of distillate per day after acid. The Ohio Oil Company's Boettcher No. 1, Sec. 28, T. 18 N., R. 9 W., Osceola County, in the Cedar field, was completed as a "Richfield" well at a total depth of 5,160 feet. Initial production was 90 barrels per day after acid. No additional wells were drilled in the new zone in these fields during 1945.

At the close of the year, the Pure Oil Company's Freer No. 1, a wildcat test in Sec. 18, T. 17 N., R. 6 W., Clare County, appeared to be another probable "Richfield" discovery. The well showed 10,000,000 cubic feet of gas and 120 barrels of distillate at a depth of 5,037 feet. Operations were suspended to complete or deepen the well.

FIELD DEVELOPMENT

In the "Basin," development was most active in the Deep River and Coldwater fields. Forty-six oil wells were completed in the Deep River field, Arenac County, a 1944 discovery. Although part of the increase was due to a change from 20- to 10-acre spacing, much of it is due to enlargement of the field area, which

TABLE III

Michigan Oil Fields*

(January 1, 1946)

Field	*County*	*Year of Discovery*	*Producing Formation*	*Depth to Pay (Feet)*	*API* Gravity of Oil*	*Drilled Acreage*	*Recovery per Drilled Acre (Barrels)*	*Production in 1945 (Barrels)*	*Accumulative Production (Barrels)*	*No. of Prod. Wells Jan. 1, 1946*
Adams	Arenac	1937	Traverse Dundee	2,025 2,930	37.0 34.0	750	7,918	1,196,268	5,938,292	64
Akron	Tuscola	1938	Detroit River	3,425	41.9	†	†	20,902	207,101	7
Ashton	Osceola	1945	Traverse Detroit River	2,944 3,650	42.0 40.0			14,264	14,264	72
Bangor	Van Buren	1939	Traverse	1,000	29.5	280	1,943	25,471	543,924	17
Beaverton	Gladwin	1934	Dundee	3,880	41.3	230	2,949	17,601	707,660	13
Belly Achers	Montcalm	1944	Dundee	3,470	48.2	240	455	58,676	109,140	4
Bentley	Gladwin	1397	Dundee	3,510	42.1	720	1,378	77,604	991,988	43
Birch Run	Saginaw	1934	Berea	1,530	43.3	260	827	2,445	214,958	11
Bloomer	Montcalm and Ionia	1944	Traverse	2,640	42.3	360	634	183,598	231,607	9
Bloomingdale	Van Buren	1938	Traverse	1,220	42.0	1,380	4,399	82,906	6,070,761	67
Breedsville	Van Buren	1943	Traverse	1,080	33.9	230	882	82,333	202,796	20
Casco	Allegan and Van Buren	1940	Traverse	1,100	38.6			883	5,199	4
Cato	Montcalm	1944	Detroit River	3,450				2,439	2,899	1
Cedar	Osceola	1943	Traverse Dundee Detroit River	3,325 3,810 5,060	 48.1 46.0	360	1,143	89,688	411,376	9
Clare City	Clare	1938	"Mich. Stray"	1,320	30.2			3,876	33,327	3
Clayton	Arenac	1936	Dundee	2,550	34.2	610	6,827	148,270	4,164,503	42
Coldwater	Isabella	1944	Dundee	3,725	46.0	2,320	422	957,918	1,026,347	57
Columbia	Van Buren	1938	Traverse	1,185	39.0	1,100	1,923	39,406	1,115,098	36
Cranberry Lake	Clare	1943	Dundee	3,800				3,366	12,978	1
Crystal	Montcalm	1935	Dundee	3,190	43.5	1,820	4,031	37,431	7,337,132	19
Currie	Isabella	1936	Dundee	3,920	45.9			3,141	164,896	2
Dalton	Muskegon	1940	Traverse	1,850		220	145	15,247	31,929	9
Deep River	Arenac	1944	Dundee	2,790		630	3,485	1,459,608	2,195,539	63
Deerfield	Monroe	1920	Trenton	2,115	42.7	155	2,692	26,747	417,325	17
Diamond Springs	Allegan	1938	Traverse	1,465	41.0	420	1,978	19,610	730,823	25
Dorr	Allegan	1938	Traverse	1,605	41.0	260	1,206	7,704	315,524	15
Douglass	Montcalm	1945	Dundee	3,400	47.1			17,127	17,127	3
Dwight	Huron	1945	Detroit River	2,862	36.2			1,040	1,040	1
East Monterey	Allegan	1945	Traverse	1,660				8,682	8,682	1
East Norwich	Missaukee	1942	Traverse Dundee Detroit River	2,410 3,080 4,390		1,480	433	428,746	640,452	37
Edenville	Midland	1938	Dundee	3,790	41.0	350	3,504	23,826	1,226,248	23
Edmore	Montcalm	1933	Traverse	3,105	43.2	90	5,089	8,540	458,928	5
Enterprise	Missaukee	1943	Detroit River	4,405				11,903	23,021	3
Essexville	Bay	1944	Dundee	2,825		1,120	395	315,663	442,270	28
Evart	Osceola	1942	Dundee	3,755	47.8	1,100	2,184	447,477	2,402,410	27
Fillmore	Allegan	1943	Traverse	1,525	41.1	620	775	221,149	480,304	57
Fork	Mecosta	1942	Dundee Detroit River	3,845 5,001	50.1 54.8	2,740	1,562	1,565,503	3,859,230	59
Geneva	Van Buren	1940	Traverse	1,010	31.5			15,557	34,637	7
Goodwell	Newaygo	1943	Traverse	2,760		1,240	671	140,038	831,795	30
Grout	Gladwin	1940	Dundee	3,825				3,466	29,192	3
Harrison	Clare	1945	Dundee	4,190	39.7			5,504	5,504	1
Hatton	Clare	1941	Dundee	3,495				16,869	118,829	2
Headquarters	Roscommon and Clare	1941	Traverse Detroit River	3,380 4,955	42.3 48.9	1,580	3,992	461,272	6,307,342	40
Hilliards	Allegan	1944	Traverse	1,590		320	246	24,709	78,747	12
Hope	Barry	1939	Traverse	1,830	39.9			9,680	24,994	9
Hopkins	Allegan	1939	Traverse	1,653	41.5	75	1,722	3,921	129,177	4
Kawkawlin	Bay	1938	Berea Dundee Salina	1,505 2,830 7,368	38.0 35.0 55.3	2,520	1,106	654,219	2,786,222	137
Lakefield	Saginaw	1937	Dundee	3,185	39.0			913	8,492	1
Leaton	Isabella	1930	Dundee	3,655	43.0	960	3,442	107,480	3,304,622	42
Marne	Ottawa	1940	"Berea"	1,165				524	6,220	2
Mill Lake	Van Buren	1938	Traverse	1,290	40.0	340	1,405	6,799	473,592	10
Monterey	Allegan	1938	Traverse	1,645	37.6	280	1,511	10,444	422,962	18
Mt. Haley	Midland	1934	Dundee	3,477	39.6			722	34,180	1
Mt. Pleasant	Isabella and Midland	1928	Dundee	3,545	41.8	4,180	5,435	249,407	22,720,235	168
Muskegon	Muskegon	1927	Traverse Dundee	1,700 2,025	37.4 32.0	2,800	2,421	18,056	6,778,358	37

TABLE III—(*continued*)

Field	*County*	*Year of Discovery*	*Producing Formation*	*Depth to Pay (Feet)*	*API* Gravity of Oil*	*Drilled Acreage*	*Recovery Per Drilled Acre (Barrels)*	*Production in 1945 (Barrels)*	*Accumulative Production (Barrels)*	*No. of Prod. Wells Jan. 1, 1946*
Muskrat Lake	Van Buren	1941	Traverse	1,285	39.2	580	534	22,079	309,532	24
New Salem	Allegan	1938	Traverse	1,625	41.0	970	3,953	138,267	3,834,529	67
North Bangor	Van Buren	1942	Traverse	1,015	32.6	250	1,123	32,146	280.801	13
North Buckeye	Gladwin	1937	Dundee	3,615	39.0	2,750	5,684	255,836	15,629,660	153
North Hamilton	Clare	1943	Dundee	4,078				2,150	7,803	1
			Berea	1,502						
Otisville	Genesee	1941	Traverse	1,894	44.3					
			Dundee	2,449	37.0			1,027	6,146	3
Overisel	Allegan	1938	Traverse	1,490	42.1	1,550	1,504	69,776	2,331,201	77
Pinconning	Bay	1944	Dundee	2,898	36.2			38,434	48,258	1
Pine	Montcalm	1938	Traverse	2,836	45.0			5,624	49,088	1
Pine River	Gratiot	1942	Dundee	3,280				979	10,044	2
Polkton	Ottawa	1942	Traverse	1,890				2,344	4,338	4
Porter	Midland	1933	Dundee	3,415	40.6	4,330	7,957	521,361	34,454,069	232
Prosper	Missaukee	1942	Dundee	3,835	43.2	520	1,500	135,402	780,081	12
			Traverse	2,925						
Reed City	Osceola and Lake	1940	Dundee	3,490		5,270	5,535	4,267,434	29,167,135	196
			Detroit River	3,585	46.3					
Richfield	Roscommon	1941	Detroit River	4,180	43.4	680	411	64,486	279,462	17
Riverside	Missaukee	1942	Dundee	3,944	44.5			6,109	37,691	1
Rockford	Kent	1945	Traverse	2,220	44.0			12,400	12,400	3
Rose City	Ogemaw	1942	Detroit River	4,090	41.2	360	186	35,861	67,013	7
Rose Lake	Osceola	1943	Traverse	3,115	45.4	680	1,085	210,889	737,648	15
Saginaw	Saginaw	1925	Berea	1,825	46.1	1,500	965	16,416	1,448,140	44
Salem	Allegan	1937	Traverse	1,570	38.3	2,110	1,513	65,832	3,191,788	118
Sauble	Lake	1942	Traverse	2,145	35.6	200	354	9,449	70,884	4
Sherman	Isabella	1936	Dundee	3,650	42.0	870	4,979	66,204	4,331,814	34
South Akron	Tuscola	1941	Dundee	2,850	37.3			628	12,875	1
South Beaverton	Gladwin	1936	Dundee	3,845	41.1	340	1,767	65,976	600,897	22
South Buckeye	Gladwin	1936	Dundee	3,570	39.0	2,040	1,983	77,233	4,045,076	71
South Monterey	Allegan	1944	Traverse	1,660	40.0	150	555	63,929	83,262	14
South Tallmadge	Ottawa	1939	Traverse	1,820	38.6	580	786	45,525	456,018	53
Temple	Clare	1938	Dundee	3,885	44.3	2,500	5,700	314,051	14,250,002	97
Trowbridge	Allegan	1937	Traverse	1,355	41.2	540	384	14,246	207,282	19
Vernon	Isabella	1930	Dundee	3,755	44.1	830	5,548	80,906	4,605,073	26
Walker	Kent and Midland	1938	Traverse	1,850	40.0	4,835	2,092	297,877	10,113,652	391
Wayland	Allegan	1944	Traverse	1,810				2,201	2,201	2
West Beaverton	Gladwin	1943	Dundee	3,876				1,426	5,674	1
West Branch	Ogemaw	1933	Dundee	2,650	36.8	2,670	2,130	245,273	5,702,464	220
West Hopkins	Allegan	1941	Traverse	1,580		310	1,234	9,397	382,473	20
Wheatland	Mecosta	1945	Dundee	3,685	43.0			3,259	3,259	0
Winfield	Montcalm	1936	Dundee	3,340	43.2			1,997	56,049	4
			Traverse	3,105						
Winterfield	Clare	1940	Dundee	3,770	44.2	960	3,804	222,946	3,651,982	35
			Detroit River	5,015						
Wise	Isabella	1938	Dundee	3,700	45.2	1,420	1,639	212,246	2,327,120	65
Woodville	Newaygo	1943	Traverse	2,820		280	573	37,517	160,405	7
Wyoming Park	Kent	1939	Traverse	1,880	39.0			7,490	128,538	10
Yost	Midland	1932	Dundee	3,420	40.6	2,010	3,752	199,239	7,561,129	84
Zeeland	Ottawa	1942	Traverse	1,495	41.9	680	297	25,115	202,288	12
Miscellaneous								2,404	270,707	23
Total State								17,267,493	239,871,744	3,536

* Fields which are abandoned or have produced less than 500 barrels during 1945 are not included.
† Drilled acreage and recovery per acre not calculated for fields in which wells are too few scattered to be significant.

now comprises 630 drilled acres. The field as now developed is almost 5 miles long and ranges from ¼ to less than ½ mile in width. New wells have had initial productions ranging from 36 to 320 barrels per hour and average approximately 175 barrels per hour. The area of the Coldwater field, Isabella County, also a 1944 discovery, was increased to 2,320 acres by the completion of 45 wells. Other

moderately active "Basin" fields were Essexville, Bay County, with 18 new wells; East Norwich, Missaukee County, with 17; Reed City, Osceola County, with 15; and Kawkawlin, Bay County, with 13 wells.

In southwestern Michigan, in Allegan County, the Fillmore field, was increased by 21 wells, and 8 new wells were completed in the South Monterey field.

TABLE IV

MICHIGAN GAS FIELDS

(January 1, 1946)

Field	*County*	*Year of Discovery*	*Producing Formation*	*Depth to Pay (Feet)*	*Drilled Acreage*	*Recovery Per Drilled Acre (M. Cu. Ft.)*	*Production in 1945 (M. Cu. Ft.)*	*Accumulative Production (M. Cu. Ft.)*	*No. of Prod. Wells Jan. 1, 1946*
Big Rapids	Mecosta	1943	"Mich. Stray"	1,135	960	34	32,207	32,207	6
Broomfield	Isabella	1929	"Mich. Stray"	1,350	6,160	1,683	636,493	10,366,298	52
Clare City	Clare	1938	"Mich. Stray"	1,290	720	2,094	119,611	1,507,775	7
Clayton	Arenac	1936	Berea	1,180	1,440	3,281	360,679	4,724,595	22
Colfax	Mecosta	1945	"Mich. Stray"	1,240	640	202	129,124	129,124	4
Cranberry Lake	Clare	1943	"Mich. Stray"	1,295	378	6,240	1,525,616	2,361,093	39
Crystal	Montcalm	1935	"Mich. Stray"	1,000	320	2,049	27,033	655,931	4
Deep River	Arenac	1926	Berea	1,490	1,040	1,147	295,572	1,193,147	10
Douglass	Montcalm	1943	"Mich. Stray"	1,190	640	29	18,495	18,495	4
East Fork	Mecosta	1942	"Mich. Stray"	1,480	640	160	6,800	102,708	1
Edmore	Montcalm	1936	"Mich. Stray"	1,300	4,400	1,353	366,990	5,951,716	15
Evart	Osceola	1941	"Mich. Stray"	1,440	4,960	489	1,311,965	2,424,073	30
Freeman	Clare	1939	"Mich. Stray"	1,475	2,040	1,561	671,033	3,184,974	12
Fremont	Isabella	1941	"Mich. Stray"	1,235	640	429	48,817	275,076	3
Goodwell	Newaygo	1943	"Mich. Stray'	1,135	2,080	839	1,658,918	1,744,685	13
Ithaca	Gratiot	1943	"Mich. Stray"	900	800	344	275,333	275,333	4
Lincoln	Clare	1938	"Mich. Stray"	1,530	2,040	2,404	1,068,586	5,770,676	13
Marion	Clare & Osceola	1940	"Mich. Stray"	1,370	10,400	1,299	3,187,409	12,583,372	64
Muskegon	Muskegon	1927	Traverse Detroit River	1,640	1,200	5,968	31,074	7,161,084	8
North Adams	Arenac	1942	Berea	1,604	160	8	1,280	1,280	1
North Star	Gratiot	1940	"Mich. Stray"	870	160	967	28,376	154,379	1
Northwest Crystal	Montcalm	1936	"Mich. Stray"	1,062	160	47	7,491	7,491	1
Reed City	Osceola & Lake	1940	"Mich. Stray"	1,220	4,480		4,548,376*	13,854,386*	23
Richland	Montcalm	1940	"Mich. Stray"	1,205	960	597	152,907	573,763	4
Riverside	Missaukee	1940	"Mich. Stray"	1,435	2,720	928	762,497	2,495,993	16
Shaver	Gratiot	1935	"Mich. Stray"	1,020	2,600	3,016	639,613	8,840,515	41
Sheridan	Mecosta	1935	"Mich. Stray"	975	320	783	2,697	250,796	3
Six Lakes	Montcalm & Mecosta	1934	"Mich. Stray"	1,270	9,520	4,549	3,398,608	43,309,624	130
South Talmadge	Ottawa	1940	Berea	1,030	320	747	2,872	239,064	2
Sylvan	Osceola	1941	"Mich. Stray"	1,525	320	239	6,246	76,610	1
Vernon	Isabella	1930	"Mich. Stray"	1,300	760	1,897	7,449	1,441,489	1
Walker	Kent	1939 1940	Berea Detroit River	1,150 1,250			37,124	4,100,727*	3
West Fork	Mecosta & Osceola	1943	"Mich. Stray"	1,525	2,080	128	259,814	266,941	13
Winfield	Montcalm	1935	"Mich. Stray"	1,125	3,040	1,213	575,529	3,686,983	16
Wise	Isabella	1940	"Mich. Stray"	1,250	800	1,554	244,280	1,243,589	6
Woodville	Newaygo	1943	"Mich. Stray"	1,185	2,080	405	664,324	842,835	13
Miscellaneous							177,310	22,652,125	89
Total State							23,298,548	163,265,020	675

* Includes dry and casinghead gas.

NATURAL GAS

Sixty-three gas wells were completed in 1945, one less than in 1944. Development was distributed among a number of previously discovered fields in the "Basin." Total production of gas, including dry and casinghead, increased to 23,298,548,000 cubic feet, compared with the 21,253,903,000 cubic feet of 1944.

DISCOVERIES

Eight gas fields and new pay zones in three fields were discovered and one field was extended during 1945 (Table II). Six of the new fields were one well pools at the end of the year. The Gilmore field, Isabella County, and Orient field, Osceola County, appear to be the most significant of the discoveries, although data are insufficient to properly evaluate them.

The Coldwater gas field, Isabella County, a new pay zone discovery, was first

TABLE V

DEEP TESTS

County	*Well*	*Section Township Range*	*Permit Number*	*Total Depth (Feet)*	*Oldest Formation Penetrated*
Alpena	Sohio Petroleum Co.—Turtle Lake Club 1	9-29N-5E	11671	2,660	Sylvania (Dev.)
Antrim	Sun Oil Co.—State Mancelona A-1	36-29N-5W	11572	4,953	Bass Island (Sil.)
Arenac	Basin Oil & Don Rayburn—Klimik 1	9-19N-4E	11451	4,298	Detroit River (Dev.)
Arenac	M. E. Holloway—Badge 1	23-19N-4E	11531	4,205	Sylvania (Dev.)
Bay	Gulf Refining Co.—Jerry 1	16-14N-6E	11407	3,935	Sylvania (Dev.)
Bay	Shell Oil Co.—Kurzeja B-1	2-16N-4E	11603	3,872	Detroit River (Dev.)
Clare	Pure Oil Co.—Wondergem A-1	6-20N-6W	11211	5,422	Sylvania (Dev.)
Clinton	Union Drlg. & Prod. Co.—Piggott 1	30-8N-3W	11390	3,925	Sylvania (Dev.)
Crawford	G. G. Hanners—Timberland 1	16-26N-2W	11774	4,317	Detroit River (Dev.)
Huron	Shell Oil Co.—Mitrovich 1	31-15N-16E	11738	2,350	Sylvania (Dev.)
Huron	C. W. Teater—Polega 1	27-18N-13E	11399	3,856	Sylvania (Dev.)
Isabella	Sohio Petroleum Co.—Hoffman 2	29-16N-6W	11304	5,090	Detroit River (Dev.)
Kent	Smith Petroleum Co.—Sherk 1	21-5N-10W	11540	5,200	St. Peter (Ord.)
Lenawee	J. L. England—Dunigan 1	7-7S-1E	9800	3,175	Trenton (Ord.)
Livingston	Panhandle Eastern—Addison 1	11-3N-3E	10990	4,486	Clinton (Sil.)
Livingston	Panhandle Eastern—Bauer 1	25-2N-5E	11818	4,214	Clinton (Sil.)
Livingston	Shell Oil Co.—Wilkinson 1	36-4N-3E	11737	4,356	Cincinnatian (Ord.)
Mecosta	Gulf Refining Co.—Gale 1	3-14N-8W	11693	4,821	Sylvania (Dev.)
Mecosta	Sun Oil Co.—Denslow 1	2-16N-8W	11075	5,198	Detroit River (Dev.)
Midland	Ashby Drilling Co.—Ames 1	37-14N-2E	11718	4,406	Detroit River (Dev.)
Midland	Ashby Drilling Co.—McCann 1	33-14N-2E	11579	4,460	Detroit River (Dev.)
Midland	Union Drlg. & Prod. & Chapman Oil—Lanphierd 1	28-15N-1E	11732	4,650	Detroit River (Dev.)
Monroe	J. W. Sturman—Chapman 1	29-5S-10E	11221	3,377	Pre-Cambrian Granite
Montmorency	McClanahan Oil & Talbot Oil—Kneeland & Bigelow 1	16-30N-3E	11710	2,410	Detroit River (Dev.)
Montmorency	E. R. Morris—Patterson & White 1	10-30N-3E	11385	2,510	Detroit River (Dev.)
Oceana	Sinclair-Wyoming Oil Co.—Newman 1	7-13N-16W	11367	3,500	Salina (Sil.)
Oceana	N. Wagenaar—Kyncl 1	35-16N-18W	11889	3,016	Sylvania (Dev.)
Osceola	Ohio Oil Co.—Boettcher 1	28-18N-9W	10005	5,160	Detroit River (Dev.)
Osceola	Sun Oil Co.—Richardson 5	10-18N-9W	11669	5,286	Sylvania (Dev.)
Osceola	Sun Oil Co.—Wilson 1	35-17N-8W	11365	5,035	Detroit River (Dev.)
Roscommon	Sun Oil Co.—St. Helen Resort C-2	27-22N-2W	11068	5,342	Sylvania? (Dev.)
Roscommon	Sun Oil Co.—State Roscommon B-1	24-21N-4W	11098	5,402	Detroit River (Div.)
Sanilac	Shell Oil Co.—Burch 1	15-10N-15E	11405	5,825	Trenton (Ord.)
Sanilac	Shell Oil Co.—Perry 1	9-9N-15E	11492	2,364	Brass Island (Sil.)
Tuscola	E. E. Brehm—Charlton 1	34-11N-8E	11111	3,370	Sylvania (Dev.)
Tuscola	Shell Oil Co.—Hutchinson 1	21-14N-10E	11346	3,945	Sylvania (Dev.)
Tuscola	J. V. Wicklund Dev. Co.—Comment 1	3-14N-10E	11247	3,660	Detroit River (Dev.)
Van Buren	W. A. Elliot—Fleckenstein 1	23-1S-15W	11245	1,710	Detroit River (Dev.)
Washtenaw	Colvin & Associates—Meinzinger 1	12-2S-7E	11341	5,692	Pre-Cambrian Granite

drilled by the Sohio Petroleum Company. The discovery well, the Gas Unit No. 1, Sec. 29, T. 16 N., R. 6 W., was completed at a depth of 1,404 feet with an initial open flow of 8,400,000 cubic feet per day. At the end of the year, eight wells had been completed and 1,280 acres proved. The average pay thickness for the field is approximately 12 feet. The producing formation is the Michigan "Stray" sandstone.

EXPLORATION

Core-testing activity as a method of exploration continued at approximately

the same rate as during 1944. Two hundred and three permits were issued, 22 more than in 1944. Slightly more than half of the tests were in the "Basin" district, and the others were concentrated in the Mason-Oceana County area on the west side of the state and in the northern "Thumb" area on the east. Geophysical work decreased during the year. No geophysical prospecting was done during the last quarter.

The basal Detroit River (Devonian) or older formations were penetrated in 39 tests in the state (Table V). Two wells reached the pre-Cambrian basement.

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DEVELOPMENTS IN NORTH MID-CONTINENT IN 1945[1]

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ABSTRACT

Kansas produced 98,429,869 barrels of oil and casinghead gasoline in 1945, which is the fourth highest yield in its history. Gas production amounted to 124,100,219,000 cubic feet. Operators showed a disposition to further hold back production especially after the termination of hostilities. Potential tests of many wells do not compare with those of previous years because operators are not desirous of building up allowables.

The Kansas exploration program slackened off in the latter part of the year from the active pace maintained during the war. Most significant discoveries were in the western part of the state from Mississippian limestone. First oil and gas production in Meade County, as indicated by wells in process of completion at the end of the year, opens up large areas in Oklahoma and Kansas on the north flank of the Anadarko basin.

The most extensively developed pool discovered during the year was the Ryan pool in Rush and Pawnee counties. Many minor extensions on the Central Kansas uplift were made. Development of Lansing-Kansas City production in Rooks and Sheridan counties improved prospects for profitable production in these areas in which heavy oil is generally found in Arbuckle dolomite. Drilling-up of many fields discovered during the war on 20-acre patterns was underway.

Developments of a technological nature were limited to increased use of gamma-neutron logs and electrical logs.

Exploration by the Amerada Petroleum Corporation of its large blocks in Dawes County, Nebraska, was the outstanding feature of a quiet year in those states of this province outside of Kansas.

INTRODUCTION

The area covered in this summary includes the states of Nebraska, Missouri, and Iowa, and all of Kansas except the shallow developments in southeastern Kansas. It does not include activity in Cowley or Butler counties or in the counties east of them. This explains the difference in statistics of this report and that published by the Committee on Statistics of Exploratory Drilling.

KANSAS

DRILLING ACTIVITY

Although there was a large increase in the development of gas reserves in southwestern Kansas, total drilling for oil and gas suffered a decline of more than 9 per cent, as shown in Table I.

TABLE I

	1945	*Percentage*	*1944*	*Percentage*	*1943*	*Percentage*
Oil wells	659	44.5	716	44.0	796	50.0
Gas wells	208	14.0	90	5.5	30	1.9
Dry holes	615	41.5	823	50.5	769	48.1
	1,482		1,629		1,595	

The decrease in the dry hole percentage from 50.5 per cent to 41.5 per cent can

[1] Manuscript received, March 17, 1946. Presented by title before the Association at Chicago, April 2–4, 1946.

[2] Gulf Oil Corporation.

[3] Darby and Bothwell, Inc.

be directly attributed to the removal of drilling restriction during the latter part of the year by the Petroleum Administrator for War and greater care in the selection of wildcat drilling prospects. Forty-acre spacing has resulted in the drilling of many unnecessary dry holes in the war years and the return to 20-acre spacing in the last several months has lowered the dry-hole percentage for the year. Moreover, many of the "war-baby" companies that entered into the oil business to slough off wartime profits engaged in wildcatting in Kansas very little in 1945 compared with previous years, so that fewer third- and fourth-rate prospects were drilled. It is worthy of note that no important discoveries can be attributed to these companies.

Productivity of new well completions continued to decline, as shown in Table II. This is due to the fact that no large flush fields have been found in Kansas for several years and also because operators are less anxious to establish inflated potentials than they were in past years.

The development of the vast Hugoton gas field in southwestern Kansas and several other smaller but prolific gas fields in Barber and Pratt counties continued at a rapid pace throughout the year and probably represents the greatest exploitation of gas reserves in the history of the state.

TABLE II

Year	*Oil Wells*	*Barrels Potential*	*Barrels Average Potential*	*Gas Wells*	*Capacity in Cubic Feet*	*Average Capacity in Cubic Feet*
1941	1,253	1,727,593	1,379	75	797,011,000	10,626,000
1942	713	788,193	1,106	89	610,769,000	6,862,572
1943	796	716,777	900	30	320,420,000	10,680,667
1944	716	481,315	672	90	1,255,123,000	13,945,800
1945	659	298,390	453	208	2,957,170,000	14,217,163

LEASING ACTIVITY

Most of the new pools found in Kansas in 1945 were in counties that were nearly solidly leases, so little leasing activity was caused by these discoveries. The discovery of gas and distillate in the Adams well No. 1 in Meade County caused considerable leasing activity in the southwestern part of the state in the latter part of the year. This activity spread as far north as Scott County. Discovery of the Manteno pool and development of other pools in Ness County kept leasing active in that county and adjoining counties.

Expiration of many leases on the Central Kansas uplift was followed by the taking up of this land, often by another company. Discovery of the Cromb and Nicholson pools in Ellis County and the Vohs, McClellan, and Palco Townsite pools in Rooks County kept leasing activity active in those counties.

The Forest City basin play was dormant throughout the year and more leases were dropped than taken up in this part of the state.

PRODUCTION

Kansas produced 98,429,869 barrels of oil and casinghead gasoline in 1945, compared with its all-time peak production of 108,441,648 barrels in 1943. The

only other years in which Kansas has produced more than 85,000,000 barrels are 1942 and 1944. In 1945, 124,100,219,000 cubic feet of gas was marketed.

For the first 9 months of 1945, Kansas' allowable was set at 275,000 barrels per day. With the post-war slackening of demand, this was cut to 260,000 barrels in October and 255,000 barrels in November and December. It was reduced again to 250,000 barrels in March, 1946.

The total potential of all wells in the state at the beginning of 1945 was 4,580,099 barrels, but this had fallen to 3,805,107 barrels by the close of the year. The all-time high potential of 8,201,960 barrels was established in March, 1942. These figures are somewhat misleading, since more accurate methods of taking potentials are now in force in Kansas than formerly prevailed, and many producing organizations, anxious to produce their wells at optimum rates, make attempt to secure maximum potential tests.

The chief development of a technological nature was an increase in and more favorable results from the use of radioactivity logs. More satisfactory use of electrical logs, especially in conditioned mud, can also be noted.

WILDCATTING

Kansas operators did not maintain the active wildcatting pace of the war years in 1945, but completed an average of one well per day among those exploratory tests classified as pool or field wildcats. There was a noticeable decrease in activity in the latter half of the year, especially among major companies and those companies which were spending "tax dollars."

TABLE III

	Total	*Oil*	*Feet*	*Gas*	*Feet*	*Dry*	*Feet*	*Total Footage*
New field tests	267	19	71,037	5	19,139	243	910,528	1,000,704
New pool tests	104	13	43,588	2	8,235	83	294,304	346,127
Outposts	67	27	102,794	12	65,495	32	118,937	287,226
Deeper pool tests	3	3	645	0	0	0	0	645
Shallower pool tests	8	6	0	2	0	0	0	0
	447	68	218,064	21	92,869	358	1,323,769	1,634,702

Table III gives a summary of all classes of exploratory drilling for 1945. Table IV shows a comparison of wildcatting from 1938 to 1945, including only those tests which are considered pool wildcats or field wildcats, according to the classification of the Committee on Statistics of Exploratory Drilling.

The average discovery well in 1945 had a depth of 3,641 feet compared with 3,766 feet in 1944. The average dry hole was drilled 3,695 feet compared with 3,707 feet in 1944. Despite the tendency for deeper drilling which has prevailed for several years, a relatively fewer number of wells were drilled as exploratory

ventures in the northwestern and southwestern parts of Kansas in 1945 so that the total depth of the average hole was reduced.

NEW POOLS

Table V lists new pools discovered in western and northeastern Kansas in 1945 as named by the Nomenclature Committee of the Kansas Geological Society. Eighteen pools had only one well at the end of the year. The more important areas are discussed.

Rush and Pawnee counties.—The leading discovery of the year is the Ryan pool in Secs. 34 and 35, T. 19 S., R. 16 W., Rush County, and Secs. 2 and 3, T. 20 S., R. 16 W., Pawnee County. The pool is similar to the Pawnee Rock pool nearby, in that the pay zone is the Arbuckle dolomite and the oil zone is thin with a thick gas cap. By the close of the year there were 22 producing wells and only one dry hole. The discovery is credited to the seismograph.

TABLE IV

Year	*Oil and Gas Wells*	*Total Feet*	*Dry Holes*	*Total Feet*	*Total Wells*	*Total Feet*
1938	43	148,050	129	478,389	172	626,439
1939	21	67,259	74	258,031	95	325,290
1940	23	75,142	122	408,887	145	484,020
1941	37	140,284	290	688,189	237	828,473
1942	34	122,041	299	1,039,753	333	1,161,794
1943	57	199,532	379	1,416,605	436	1,616,137
1944	66	256,376	428	1,586,558	494	1,842,737
1945	39	141,999	326	1,204,832	365	1,346,831

Ellis and Rooks counties.—Geophysical exploration occasioned two discoveries in these adjoining counties. The more promising—the Vohs pool—was opened by Darby and Bothwell's Vohs No. 1, Sec. 14, T. 10 S., R. 19 W. The principal pay is the Lansing-Kansas City limestone, where there appears to be a considerable reserve, as the pay is much more prolific than the near-by Zurich pool, which has been producing for several years. In Ellis County the Cromb pool does not offer the promise as does the Vohs; however, it is still a one-well pool and future development might greatly improve its prospects.

Meade County.—Perhaps the greatest interest in Kansas has centered in the southwestern part of the state, where the Stanolind Oil and Gas Company completed Adams Ranch No. 1 at the SW. corner of Sec. 8, T. 35 S., R. 30 W., as an 88,000,000-cubic-foot gas well. The gas is wet and makes considerable distillate—the exact amount has not been thoroughly ascertained. The importance of this discovery is that the pay zone is the Chester series of upper Mississippian age, which heretofore has not produced in Kansas. Although the Stanolind's well is only a short distance from the Oklahoma state line, the presence of this discovery greatly enhances the productive possibilities of this arm of the Anadarko basin, which extends into the southwestern part of Kansas.

TABLE V

WESTERN KANSAS POOLS, 1945

Pool	*County*	*Sec.-T.-R.*	*Total Depth (Feet)*	*Producing Formation*	*Method of Exploration*	*Potential (Barrels)*
Adams Ranch	Meade	8-35S-30W	7,921	"Miss. lime"	Core drill	88,000,000 gas
Atherton North	Russell	7-13S-14W	3,200	Arbuckle	Subsurface	462
Atherton West	Russell	23-13S-15W	3,336	Lans.-K.C.	Subsurface	29
Battle Hill	McPherson	24-18S- 1W	2,845	"Miss. lime"	Subsurface	1,790
Beaver South	Barton	27-16S-12W	3,364	Arbuckle	Subsurface	349
Behrens	Barton	6-20S-15W	3,755	Arbuckle	Non-technical	250
Bellman	Sumner	15-30S- 1E	3,920	Simpson	Core drill	141
Benson	Pawnee	30-23S-15W	4,165	Arbuckle (gas) Lans.-K.C. (oil)	Seismic	140,000,000 gas
Cotton	Trego	15-12S-21W	3,978	Arbuckle	Subsurface	40
Cromb	Ellis	22-11S-20W	3,710	Lans.-K.C.	Seismic	190
Donovan North	Russell	3-15S-15W	3,308	Arbuckle	Subsurface	75
Dundee	Barton	29-20S-14W	3,642	Arbuckle	Subsurface	6,000,000 gas
Faulkner	Graham	27-10S-22W	4,100	Lans.-K.C.	Subsurface	406
Feltes NW.	Barton	3-16S-12W	3,345	Arbuckle	Subsurface	117
Greenwich S.	Sedgwick	22-26S- 2E	2,909	"Miss. lime"	Subsurface	437
Herzog N.	Ellis	19-13S-16W	3,493	Arbuckle	Surface	2,453
Hiss W.	Barton	36-20S-14W	3,276	Lans.-K.C.	Seismic	4,470
Hohn	Sedgwick	22-27S- 1W	2,828	Lans.-K.C.	Non-technical	50
Logan	Phillips	3- 5S-20W	3,554	Lans.-K.C.	Core drill	201
Loretto	Rush	21-16S-17W	3,548	Arbuckle	Subsurface	1,300,000 gas
Luck	Graham	13- 8S-22W	3,610	Lans.-K.C.	Core drill	328
Manteno	Ness	31-19S-25W	4,580	"Miss. lime"	Surface	400
McClellan	Rooks	9- 9S-19W	3,529	Lans.-K.C.	Subsurface	185
Medicine Lodge NE.	Barber	8-33S-12W	4,593	"Miss. lime"	Subsurface	5,000,000 gas
Nicholson	Ellis	30-11S-20W	3,855	Arbuckle	Core drill	446
Palco Townsite	Rooks	20- 9S-20W	3,865	Arbuckle	Core drill	211
Perth	Sumner	12-33S- 2W	4,278	Simpson	Seismic	157
Petrie	Sedgwick	36-26S- 1W	3,392	Viola	Subsurface	417
Ray W.	Norton	26- 5S-21W	3,717	Arbuckle	Core drill	102
Ryan	Rush	35-19S-16W	3,765	Arbuckle	Seismic	2,591
Ryan SE.	Pawnee	12-20S-16W	3,780	Arbuckle	Subsurface	143
Shady	Pawnee	34-22S-16W	4,107	Arbuckle	Seismic	36,500,000 gas
Studley SW.	Sheridan	32- 8S-26W	4,323	Lans.-K.C.	Core drill	280
Unruh	Barton	24-20S-15W	3,690	Arbuckle	Seismic	2,565
Val Verde	Sumner	23-33S- 2E	3,287	Bartlesville	Subsurface	15
Vohs	Rooks	14-10S-19W	3,562	Arbuckle	Seismic	380
		NORTHEASTERN KANSAS POOLS				
Fairmont	Leaven-worth	6-10S-23E	1,750	Penn. sand	Non-technical	200,000 gas
Lawrence	Douglas	33-12S-20E	1,813	Penn. sand	Subsurface	100,000 gas
Lost Springs N.	Dickinson	22-16S- 4E	2,308	"Miss. lime"	Subsurface	88

Barton County.—Even as the Ryan pool is the leading discovery of the year, the Unruh (a near-by pool) is the leading disappointment of the year. It was discovered under similar conditions, even as to method of prospecting—the seismograph. The pay zone is well below the top of the Arbuckle dolomite with a thick gas cap similar to the Ryan. The discovery well was completed for 2,565 barrels of oil per day. Offsets have been unsuccessful in finding any oil, one being com-

pleted as a 7,000,000-cubic-foot gas well and the other two have been temporarily abandoned.

A number of years ago, Lansing-Kansas City production was found in the Hiss pool over a small buried granite hill. During the year, the Phillips Petroleum Company discovered another Lansing-Kansas City pool over a near-by granite hill. Being near similar production, it has been designated Hiss West. These knobs are small, so no great amount of reserves are proved by the discovery.

Ness County.—The discovery of oil in the Mississippian in the Manteno pool in T. 19 S., R. 25 W., revived activity in that area. However, offsets were very disappointing. The discovery well made 400 barrels from dolomite.

Pawnee County.—Two important discoveries of sour Arbuckle gas were made. Three miles east of the Zook field, where sour Arbuckle gas is being "scrubbed" successfully, the Benson field discovery in T. 23 S., R. 15 W., produced initially 104,000,000 cubic feet. The test is shut in as a gas producer because of no means of handling the gas and because of its ability to produce 357 barrels of oil from the Lansing-Kansas City. A few miles to the northwest the J. M. Huber Corporation, in Sec. 34, T. 22 S., R. 16 W., completed a 36,500,000 cubic-foot sour gas well. The test is capable of a larger capacity, as it was completed with a string of tools in the hole and it was not acidized. These sour gas discoveries eventually will become important—when facilities are available to handle the gas.

Sumner County.—In our unending effort in hunting for Simpson sand production, mention should be made of the recent discovery of the Bellman field. The discovery was made on a small core-drill "high," where the discovery well, Summitt's Bellman No. 1, NE. ¼, SW. ¼ of Sec. 15, T. 30 S., R. 1 E., was completed, producing potentially 172 barrels of oil which tests 51° corrected. The top of the Simpson was found at 3,697 feet. Two tests now in the process of completion give promise of being better than the discovery. The field appears to be a stratigraphic or lithologic trap.

MISSOURI AND IOWA

No important wildcats were completed in either the Missouri or the Iowa part of the Forest City basin. A wildcat of more than usual interest was started in Sec. 10, T. 65 N., R. 36 W., a few miles northwest of Maryville, Missouri. However, by the year end the test had not reached the pre-Pennsylvanian, due to bad fishing jobs.

No tests were drilled for oil in southwestern Iowa. However, there was one deep test drilled for water. This test was drilled by the Northern Natural Gas Company in Sec. 11, T. 75 N., R. 39 W., to the depth of 3,205 feet. Information on the test is confidential.

NEBRASKA

No new pools were found in Nebraska during 1945. Less than half as many wildcats were drilled in 1945 as in 1944, there being four in eastern Nebraska, and

three in western ranges. The total footage in east ranges was 10,359 feet, and that in west ranges 14,887 feet. Principal interest during the year centered around the Amerada's play on the Chadron anticline in the far northwestern part of the state. After nearly 2 years of geophysical exploration, the Amerada Company drilled four wildcats on extensive blocks taken astride the Nebraska-South Dakota line. Two wells were drilled in each state. While these tests were drilled as confidential tests, Amerada is periodically releasing samples and information on these wells.

Table VI gives a summary of Nebraska wildcats in 1945.

TABLE VI

County	*Sec.-T.-R.*	*Operator and Farm*	*Total Depth (Feet)*	*Formation*	*Method*
		1945 WESTERN NEBRASKA WILDCATS			
Scottsbluff	6-20N-54W	Fuerst Production—Dorsch 1	5,283	Lakota or Dakota?	
Dawes	10-32N-52W	Amerda—Ostermeyer 1	5,110	Pre-Cambrian	Seismograph
Dawes	16-33N-49W	Amerada—State of Nebraska 1	4,494	Pre-Cambrian	Seismograph
		1945 EASTERN NEBRASKA WILDCATS			
Gage	24- 1N- 6E	Gage County Development—Stanoshezk 1	2,762	Pre-Cambrian	Surface and chance
Richardson	35- 1N-15E	Tomer Production—Miles 1	2,750	Hunton	Chance
Gage	16- 3N- 5E	Ellis Oil—Bankers Life 1	2,319	Devonian	
Gage	27- 5N- 6E	Dan Kees—Terry 1	2,528	Pre-Cambrian	Chance

The following is the 1945 and cumulative production to December 31, 1945, for southeastern Nebraska.

Pool	*Production 1945 (Barrels)*	*Cumulative To End 1945 (Barrels)*
Barada	112,973	851,992
Dawson	24,035	136,793
Falls City	185,750	3,737,906
Shubert	0	107,807
	322,758	4,834,498

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DEVELOPMENTS IN OKLAHOMA IN 1945[1]

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ABSTRACT

Production of crude oil in Oklahoma totalled 139,227,502 barrels in 1945, an increase of 15 million barrels, or 12.1 per cent, the largest increase in barrels of any state. Reserves, however, declined from 970,262,000 barrels to 889,839,000 barrels, a decrease of 80,423,000 barrels or 8.3 per cent.

There were 2,351 wells drilled during 1945, an increase of 461 or 24.4 per cent. Exploratory wells increased from 345 to 418, or 21.2 per cent, while the number of successful exploratory wells increased from 99 to 118, an increase of 20.2 per cent. These exploratory successes include 51 new oil fields, 22 new gas fields, 33 extensions to old fields, and 12 new producing formations.

In spite of the increase in drilling, few fields of outstanding importance were discovered. Probably the most closely watched area of the year has been in Ts. 6 to 8 N., Rs. 3 W., McClain County, where the Carter Oil Company has drilled a dozen deep holes seeking Ordovician production on the west flank of the granite ridge. In Sec. 22, T. 5 N., R. 4 W., also in McClain County, an Ordovician pool of possible importance was discovered by the Cities Service Oil Company.

Geophysical activity increased both in amount and kinds, with seismograph and gravimeter registering large increases in use, and magnetometer and torsion balance being used again. A radioactivity survey was reported for the first time.

INTRODUCTION

Oklahoma's position as an oil-producing state improved during 1945. The increase in production of 15,008,118 barrels not only restores Oklahoma to the position of third ranking state, but is the largest increase of any state in the Union. With an increase in national production of only 58 million barrels, Oklahoma's increase represents 26 per cent of the total national increase. Texas, which in 1944 increased its production over 150 million barrels, had an increase in 1945 of only about 5½ million barrels, while California, with an increase in 1944 of 27 million barrels, was the only rival to Oklahoma with an increase of about 14½ million barrels. Louisiana, which ranked as third producing state in 1943 and 1944, is about 2½ million barrels behind Oklahoma.

Reserves declined 80½ million barrels, totalling 889,839,000 barrels at the end of 1945, which places Oklahoma as the fourth ranking state in this category. Louisiana, the third ranking state is credited with nearly twice the reserves Oklahoma has. This decline in reserves mars an otherwise encouraging report for Oklahoma during 1945.

DEVELOPMENT

Oklahoma produced 139,227,502 barrels[3] of crude oil during 1945, an increase

[1] Presented by title before the Association at Chicago, April 2–4, 1946. Manuscript received, March 13, 1946.

[2] The Pure Oil Company. The assistance of numerous companies and individuals in supplying data, checking information, typing and proof-reading the manuscript, *et cetera*, is acknowledged and appreciated. Insofar as possible, companies have been given the opportunity to check data as published on their wells.

[3] State and county production figures are taken from the Oklahoma Corporation Commission's Report of Pipe Line Runs for 1945. All figures for proved reserves are taken from the 1945 report of the American Petroleum Institute's Committee on Petroleum Reserves, published on February 21, 1945.

of 15 million barrels or the largest increase since 1937. This is an increase of 12.1 per cent, as compared with a national increase of 3.5 per cent. Oklahoma is credited with the discovery of 22,175,000 barrels of new oil and the addition of 35,621,000 barrels by revisions and extensions, or a total of 57,796,000 barrels of oil added to reserves. However, this is less than half the state production of 139,227,000 barrels, and causes a decrease of 81,431,000 barrels in proved reserves, which are estimated at 889,839,000 barrels.

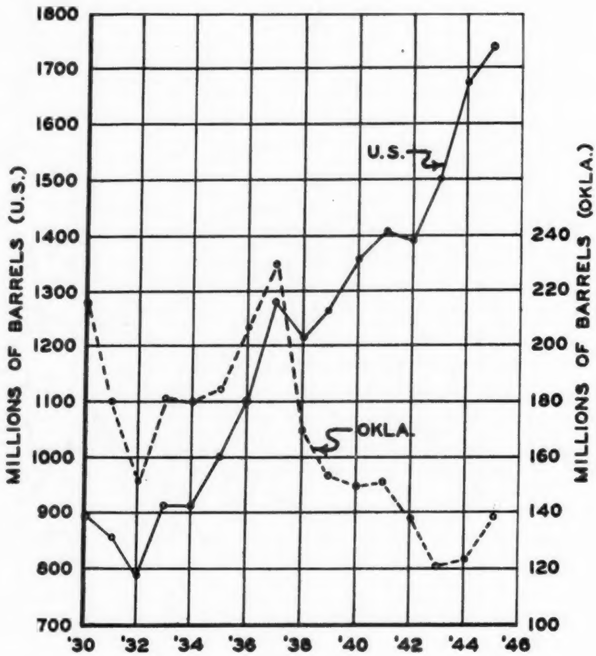

FIG. 1.—Graph showing relation of Oklahoma production to national production, 1930–1945.

Oklahoma County continues to lead all counties in production, having produced 26.2 per cent of the state's total output for 1945. With an increase of nearly 12 million barrels it produced more than the next three ranking counties combined. About 26½ million barrels of this oil was from the West Edmond field alone. The six leading counties produced 60.6 per cent of the total oil. Table I lists these counties and their production during 1944 and 1945 and the percentage of the state's total of each county's production.

The 15-million-barrel increase in state production was gained by drilling 2,351 wells, an increase of 461 wells or 24.4 per cent. There were 418 exploratory

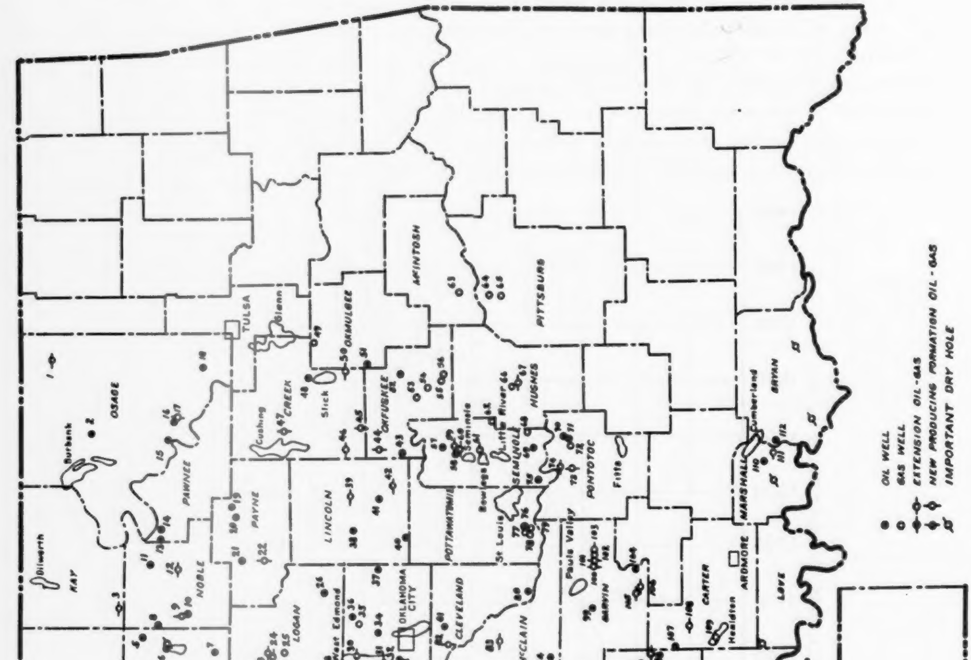

FIG. 2.—Map showing new oil and gas pools, extensions, and new producing formations, and important dry holes drilled in 1945.

wells drilled, of which 118 were successful, yielding 51 new oil pools, 22 new gas pools, and 45 extensions and new producing formations. The total of 73 new oil and gas pools is an increase of 29, or 66 per cent over 1944's list of 44 new discoveries.

The ratio of discoveries to wildcats drilled increased considerably, being one discovery to 6.5 wildcats in 1944 and one discovery to 5.1 wildcats in 1945.

Table II is a summary of all wells drilled in Oklahoma from 1941 to 1945.

TABLE I

COMPARATIVE PRODUCTION OF SIX LEADING COUNTIES

County	*Production in 1945 (Barrels)*	*Percentage*	*Production in 1944 (Barrels)*	*Percentage*
Oklahoma	36,509,973	26.2	24,916,441	20.1
Seminole	13,652,922	9.8	14,452,991	11.6
Osage	10,010,746	7.2	10,382,006	8.4
Creek	8,564,412	6.2	8,323,136	6.7
Carter	8,205,753	5.9	7,850,827	6.3
Caddo	7,406,495	5.3	6,483,328	5.2
Total	84,350,301	60.6	72,408,829	58.3

TABLE II

COMPARATIVE BREAK-DOWN OF WELLS DRILLED 1941–1945

		Number of Exploratory Wells						
	Total	*Oil*	*Gas*	*Dry*	*Extension*	*New Formation*	*Total*	*All Others*
1945	2351*	51	22	301	32	12	418	1,933
1944	1890	36	8	244	30	27	345	1,545
1943	1187	34	10	254	23	15	336	851
1942	1191	32	7	178	21	15	253	938
1941	2162	39	2	190	13	27	271	1,891

* Total number of wells drilled in 1945 taken from *Oil Weekly*.

DISCOVERIES

There were more new oil and gas pools discovered in 1945 than in any previous year for several years. With 51 new oil fields and 22 new gas fields this exceeds by 29, or 66 per cent, the total of 44 for last year. It is of interest to note that while the number of exploratory wells drilled increased 21.1 per cent the number of pools discovered increased 41.6 per cent. Table III lists 118 successful exploratory tests[4] for the year, including 33 extensions and 12 new producing

[4] There were two other oil fields discovered during the year that are not included in Table III since the wells were not officially completed during 1945. These are the Superior Oil Company's Manning No. 1, Sec. 27, T. 22 N., R. 10 W., Major County, drilled as a tight hole but reported to be producing from a Pennsylvanian sand, possibly Prue, topped at about 6,700 feet, with total depth at 8,270 feet, and reported to be plugged back to 6,790 feet. It is reported to produce about 100 barrels of oil per day and is called the Ringwood pool. Location was made after a seismograph survey. The second well is the Sohio Oil Company's Tolbert No. 1, Sec. 9, T. 3 N., R. 1 W., Garvin County, which

FIG. 2.—Map showing new oil and gas pools, extensions, and new producing formations, and important dry holes drilled in 1945.

TABLE III

NEW POOLS—EXTENSIONS AND NEW PRODUCING FORMATIONS DISCOVERED DURING 1945

Index No.*	Location	County	Field	Type†	Operator	Farm	Date	Producing Formation	Depth (Feet)	Total Depth (Feet)	Plugged Back	Initial‡ Production	Method of Exploration
1	21-28-11	Osage		Ext.	Oliphant	Osage	6-2	Wayside	1,055	1,085		75	Subsurface
2	18-26-8	Osage	Drummond Ran.	New	Norbla et al.	Drummond	11-27	Prue	2,300	2,328		S. Fl. 150	Surface
3	25-25-2W	Kay	Tonkawa	Ext.	Continental	Mansfield	8-21	Miss.	4,277	4,401		S.P. 51 Oil-10 Wtr.	Subsurface
5	34-24-3W	Garfield	N. Barnes	New	Con-Tex.	Wolfe	3-5	2nd "Wilcox"	4,838	4,847		Fl. 250	Seismograph
4	24-24-5W	Garfield	SW. Hunter	New	Atlantic	Schmidt	12-18	1st. "Wilcox"	6,139	6,303		Pf. Fl 152	Seismograph
11	12-23-1	Noble	Red Rock	New	Deep Rock	Arandell	12-3	"Wilcox"	4,593	4,600		Fl. 261	Seismograph
8	19-23-2W	Noble	W. Billings	New	Deep Rock et al.	White	11-21	Dol. & "Wilcox"	4,415	4,450		382	Seis. & sub.
14	27-23-3	Pawnee		New	Jackson et al.	Donahoe	4-9	Red Fork	3,582	3,609		P. 53-44 Wtr.	Surface
13	30-23-3	Pawnee	NW. Watchorn	New	Sunray	Gilbert	9-3	Layton	2,726	2,742		S.P. 10½ Oil-20 Wtr.	Subsurface
12	22-22-1	Noble	Otoe	Ext.	Sunray	Robedaux	2-26	Layton	3,335	3,353	3,340	P. 20-120 Wtr.	
9	27-22-2W	Noble	Polo	N. fm.	Sun	Devoire 2	9-5	Tonkawa	3,225	4,930	3,264	261-30 Wtr.	Subsurface
10	34-22-2W	Noble	S. Polo	New	Magnolia	Wollard	8-27	Bartlesville	4,678	4,691		S. Fl. 193	Subsurface
6	6-22-3W	Garfield	New Garber	New	Cities Service	Mariner	4-16	Arbuckle	5,247	5,297	5,260	A.P. 93 Oil-60 Wtr.	Seismograph
15	2-22-7	Osage		New	Peters & Norbla	Long 2	7-21	Hominy	2,858	2,928		P. 30	Sur. & sub.
16	15-22-8	Osage		New	Wilcox	Wister	6-15	Burgess	2,532	2,551		Fl. 287	Surface
17	15-22-8	Osage	W. Blackdog	N. fm.	Wilcox	Wister 2	9-15	Arbuckle	2,793	2,813		Fl. 550	
18	30-21-11	Osage	Wildcat Hill	New	Ashland	Osage	8-10	Hominy	2,445	2,565	2,460	Fl. 20	Sur. & sub.
7	12-20-4W	Garfield	E. Brown	New	Gulf	Decker	9-6	2nd "Wilcox"	6,078	6,156	6,153	P. 80-6 Wtr.	Seismograph
19	34-20-4	Payne	S. West Point	New	No. Ordnance	DeWitt	6-8	Bartlesville	3,570	4,008		Pf. Swb. 30 Oil-42 Wtr.	Seismograph
21	18-19-2	Payne		New	Hanlon-Buchanan	Heiring	2-26	Misener	4,544	4,547		Fl. 100	Seismograph
20	6-19-4	Payne	Council Creek	New	Halliburton	Drum	11-5	Bartlesville	3,728	4,249	3,738	S.P. 10	
22	18-18-2	Payne	Ramsey	New fm.	Mid-Continent	Wetzel 3	6-5	2nd "Wilcox"	4,763	4,831		Pf. Fl. 720	
23	25-18-4W	Logan	Lovell	Ext.	Phillips	Mize	12-17	Layton	4,782	4,862	4,813	S. Fl. 568-3% Wtr.	Subsurface
24	35-18-4W	Logan	Lovell	Ext.	Fox & Fox	Hudson 2	3-26	Layton	4,842	4,916	4,873	Fl. 47	
25	13-17-4W	Logan	E. Crescent	New gas	Magnolia	Stobaugh 2	6-22	Layton	4,902	4,935		Fl. 17,000 M	Subsurface
47	8-17-8	Creek	Olive	N. fm.	Mid-Continent	Hettie	7-23	Dutcher	3,223	3,331		Pf. P. 25	
27	26-16-5W	Kingfisher	NW. Cashion	New	Phillips et al.	Jirick	9-24	Hunton	7,064	7,393		Pf. A. Fl. 629	Subsurface
48	15-16-10	Creek		New	Cole	Parks	4-30	Dutcher	2,652	2,666		P. 20	
49	20-16-12	Okmulgee		New gas	Williams & Copeland	Irby	5-7	Dutcher	2,137	2,175		5,000 M	Seismograph
26	2-15-1W	Logan	NW. Evansville	New	Texas	Arundel	9-3	Bartlesville	5,234	5,925	5,270	Pf. Fl. 114	Seismograph
28	24-15-5W	Kingfisher	W. Edmond	Ext.	Anderson-Pritchard	Stewart	5-14	Hunton	6,984	7,293	7,039	Pf. AFl. 292	Subsurface
36	15-14-2W	Oklahoma	Coffee Creek	New	Gulf	Beck	2-9	Hunton	5,756	6,208	6,167	Pf. A. Fl. 86 11 Wtr.	Seismograph
35	28-14-2W	Oklahoma		New gas	Harper-Turner	Bailey	11-19	Bartlesville	5,845	6,182		Pf. 1,500 M	
38	15-14-3	Lincoln	E. Warwick	New	Sorrels	Sukovaty	2-19	Prue	4,007	4,043	4,019	S. Fl. 42	
30	23-14-4W	Oklahoma	W. Edmond	Ext.	Apex	McKee	6-25	Bartlesville	6,314	6,935	6,360	S.P. 66	
29	1-14-5W	Canadian	W. Edmond	Ext.	Fox & Fox	Roush	2-26	Hunton	7,005	7,125		Pf. A. Fl. 450	
39	8-14-5	Lincoln	W. Davenport	Ext.	Jackson	Mears	5-28	Cleveland	2,766	3,526	3,350	Pf. Fl. 45	
46	4-14-7	Creek	Hickory Grove	Ext.	Phillips	Marchant	4-16	Prue	2,833	2,904		S. Fl. 391	
45	33-14-8	Creek	SE. Arno	N. fm.	Deaner	Duran	1-15	Skinner	2,487	2,525		P. 50	
50	1-14-10	Creek	Slick	Ext.	Martin et al.	Jackson	8-28	Dutcher	2,483	2,489		Fl. 250	Subsurface

TABLE III—(*continued*)

Index No.*	Location	County	Field	Type†	Operator	Farm	Date	Producing Formation	Depth (Feet)	Total Depth (Feet)	Plugged Back	Initial Production	Method of Exploration
37	23-13-1	Oklahoma	NE. Jones	New	Stanolind	Bednar	9-10	Cleveland	4,637	5,880	4,673	Pf. P. 50	Subsurface
34	24-13-3W	Oklahoma	Lone Star	New	Gutowsky	Crum	9-24	Cleveland	5,689	6,949	5,916	Pf. P. 12-12 Wtr.	
31	33-13-4W	Oklahoma	W. Edmond	Ext.	Magnolia	Whetstone	5-14	Hunton	6,969	7,090		Pf. A. Fl. 567	
41	19-13-5	Lincoln	S. Parks	New	Mid States	Barnes	2-19	Prue	3,640	5,002		Pf. 15-85 Wtr.	Subsurface
44	21-13-7	Okfuskee		N. fm.	Summers	Aldridge	12-10	Prue	2,762	2,842		S-3700 M	
51	6-13-11	Okmulgee		New	Monarch	West	5-1	Misener	3,168	3,280	3,200	S.P. 8	
40	32-12-3	Lincoln	S. Winn	New	Aladdin & Atlantic	Young	11-27	Bartlesville	4,858	5,764	5,065	P 19	Seismograph
32	8-12-4W	Oklahoma	W. Edmond	Ext.	Phillips	Airport	8-20	Hunton	7,193	7,253		Pf. A. Fl. 546	
33	22-12-4W	Oklahoma	Bethany	New	Kerlyn	Classen	3-11	Hunton	7,154	7,950	7,220	Pf. Fl. 404 19,729 M Gas	Subsurface
42	2-12-5.	Lincoln	Wilzetta	Ext.	McMahon	Vlasak	10-8	Simp. dol.	4,435	4,481		A. Fl. 625	
43	20-12-7	Okfuskee	S. Padon	New	Crosbie & Warren	Sykora	5-3	Cromwell	3,870	4,751	3,950	Pf. P. 150	Seismograph
52	23-12-10	Okfuskee	N. Blakely	New	Wood	Smith	10-8	Booch	2,488	2,518		Fl. 115	Seismograph
53	15-11-9	Okfuskee	Greenlease	New gas	Phillips	Overall 2	8-6	Cromwell	3,351	4,224	3,405	Pf. 14,000 M	
54	31-11-10	Okfuskee		New gas	Wilcox	Yahola	2-7	Booch	2,627	3,163	2,660	S. 1,625 M	
81	19-10-2W	Cleveland	Moore Harp	New	Harp	Matheson	8-27	Bartlesville	7,568	8,965	7,860	Pf. P. 57	
82	29-10-3W	Cleveland	W. Moore	N. fm.	Mid Continent	Turk	6-8	Bartlesville	7,840	8,981	7,894	Pf. Fl. 491	
57	16-10-7	Seminole	SW. Sylvian	New	Ashland	Wallace	7-23	Gilcrease	3,661	3,668		Fl. 103	Subsurface
55	16-10-10	Okfuskee		New gas	Amerada	Canard	8-20	Cromwell	3,291	4,878	3,381	10,200 M	Seismograph
56	23-10-10	Okfuskee		New gas	Amerada	Barry	9-12	Cromwell	3,157	3,993	3,211	Pf. 14,688 M	Seismograph
59	4-9-7	Seminole	Cheyarha	Ext.	Hall-Troup-Moore	Harris	5-28	Booch	3,469	3,504		S. Fl. 45	
58	6-9-7	Seminole	SW. Cheyarha	New	Ashland	Norvell	8-20	Booch	3,664	3,684	3,682	P. 68	Subsurface
60	8-9-7	Seminole	Cheyarha	Ext.	Ilco	Allred	9-24	Booch	3,586	3,632		Fl. 175	
63	9-9-14	McIntosh	Cummings	New gas	Swick	Well	9-3	Gilcrease	2,700	2,723		19,700 M	Seismograph
88	10-9-25W	Beckham	Erick	N. fm.	Tidewater et al.	Baldwin	7-16	Granite wash	6,785	7,559	6,968	Pf. 22,630 M	Subsurface
61	7-8-7	Seminole	Bowlegs	Ext.	Mealy Wolfe	Wallace	11-21	Cromwell	3,298	3,326		Fl. 175-30 Wtr.	Subsurface
62	34-8-8	Seminole		New gas	Brown	Orwig	10-3	Calvin	1,130	1,252	1,160	S.A 2,000 M	Seismograph
64	20-8-14	Pittsburg	Choate Pr.	New gas	Public Service	Van Hoozer	1-8	Gilcrease	3,655	3,902		4,500 M	Sur. & sub.
83	9-7-3W	McClain	Washington	Ext.	Carter	McBride	4-23	2nd "Wilcox"	10,601	10,647		Fl. 2,520	Seismograph
66	19-7-10	Hughes	W. Horns Cor.	New gas	Deep Rock	Strickland 2	8-13	Cromwell	3,830	3,957		Pf. 4,030 M	Seismograph
67	32-7-10	Hughes	Horns Corner	Ext.	Deep Rock	Hudson	5-7	Cromwell	3,825	3,839		Fl. 222	
65	5-7-14	Pittsburg	E. Ulan	New gas	Public Service	Travis	5-14	Booch	1,867	2,160	1,925	1,400 M	Sur. & sub.
87	36-7-14W	Kiowa	SW. Carnegie	New	Fox & Fox	Campbell	11-26	Pontotoc	768	810		A.P. 82	Seismograph
80	26-6-1W	Cleveland	W. Corbett	New	Magnolia	Anneller	3-26	Bartlesville	6,085	7,035	6,207	Pf. P. 105	Seismograph
76	21-6-3	Pottawatomie	W. Asher	New	Kerlyn	Bourassa	5-7	Simp. dol.	4,116	4,397	4,211	Pf. P. 165-1,200 Wtr.	Subsurface
77	21-6-3	Pottawatomie		New gas	Phillips	Bourassa	9-24	Layton	2,912	4,246	2,975	29,000 M	
78	28-6-3	Pottawatomie		New gas	Texas	Vestel	1-10	Layton	2,854	4,463	2,910	Pf. 15,000 M	Seismograph
79	34-6-3	Pottawatomie		New gas	Cities Service	Hoffman	5-7	Wannette	3,446	3,646		Pf. 3,640 M	Subsurface
75	35-6-5	Seminole		New	Crosbie	Mathis	12-10	Senora	2,213	2,220		Fl. 250	Subsurface
69	20-6-7	Seminole	S. Wofford	New	Hall	Payne	8-6	Senora	1,908	4,203	1,930	P. 46	
68	18-6-8	Seminole		New gas	Gillespie	Patton	12-10	Gilcrease	2,708	4,203	2,910	Pf. 6,100 M	
89	3-6-21W	Greer	Lake Creek	New	Thomasson	Craig	7-11	Granite wash	607	635		P. 3	
84	22-5-4	McClain	N. Lindsay	New	Cities Service	Lawson	8-4	Bromide	10,791	11,000		Pf. Fl. 1,296	Seismograph
74	33-5-6	Pontotoc	Conservation	Ext.	Shaw	Broyles	7-30	Hunton	2,576	3,038		Pf. A.P. 30	Seismograph
85	33-5-6W	Grady	Chitwood	New gas	Magnolia	Cunningham	10-8	Springer sd.	10,879	10,891		Pf. 17,400 M	Seismograph

TABLE III—*(continued)*

Index No.*	Location	County	Field	Type†	Operator	Farm	Date	Producing Formation	Depth (Feet)	Total Depth (Feet)	Plugged Back	Initial‡ Production	Method of Exploration
113	7-5-8ECM	Cimarron	Keys	Ext.	Pure	State	10-24	Cherokee sd.	4,787	5,160	4,863	A.S. 14,000 M	Core
114	26-5-8ECM	Cimarron	Keys	Ext.	Pure	Rose	1-6	Cherokee sd.	4,640	5,550	4,709	14,000 M	Core
86	3-5-12W	Kiowa	Apache	N. fm.	Lynch	Peterson	1-22	Permian sd.	795	814		A. Fl. 47	
73	17-4-6	Pontotoc		N. fm.	Senora	Skirvin-Tyson	3-19	Hunton	2,315	2,753		Pf. A.P. 50-10 Wtr.	
70	1-4-7	Pontotoc		New	Sunray	Busby	11-18	Misener	3,793	4,500	3,909	240	Seismograph
72	9-4-7	Pontotoc		New gas	Crosbie	Kelly	12-17	Gilcrease	1,810	4,456	1,889	Pf. 3,000 M	Subsurface
71	11-4-7	Pontotoc		New	Ashland	Hales	9-17	Gilcrease	2,051	2,062		Fl. 18	Subsurface
116	29-4-13ECM	Texas		Ext.	Panhandle East.	Fox	4-2	Permian dol.	2,745	2,770	2,752	8,652 M	
110	13-3-1	Garvin	E. Pauls Val.	N. fm.	Ohio	Mullinix-Feaster	4-2	McLish	3,077	3,092		Fl. 150	
99	13-3-2W	Garvin	E. Antioch	New	Cities Service	Abernathy	9-17	Bromide	5,493	5,667	5,530	P. 175-5 Wtr.	Seismograph
103	16-3-2	Garvin	E. Pauls Val.	Ext.	Texas	Tripp	4-9	Penn. sd.	2,956	4,152	3,700	Pf. A. Fl. 70	Subsurface
102	17-3-2	Garvin	E. Pauls Val.	Ext.	Ohio	Brundidge	2-19	Penn. congl.	2,915	3,155		Pf. A. Fl. 76	
101	18-3-2	Garvin	E. Pauls Val.	N. fm.	Ohio	Lewis-Wacker	2-26	Bromide	3,000	3,049		Fl. 265	
115	21-3-8ECM	Cimarron	S. Keyes	New gas	Stanolind	Omohundro	10-31	Penn. sd.	4,801	5,117	4,822	Pf. 2,600 M	
93	36-2-8W	Stephens	S. Marlow	New gas	Gulf	Briscoe Est.	9-10	Penn. sd.	7,732	8,104	7,795	Pf. 78,500 M	Seismograph
104	14-1-1	Garvin	NE. Butterly	New	Continental	Butterly	9-26	Oil Creek	3,879	4,422	4,109	Pf. 240 Est.	Seismograph
105	15-1-1W	Garvin	NW. Hoover	Ext.	Helmerich-Payne	Freeman 13	5-21	Penn. sd.	1,885	2,492	2,446	Pf. 2,000 M	
106	24-1-1W	Garvin	NW. Hoover	Ext.	Helmerich-Payne	Freeman A-4	12-22	Penn. sd.	1,440	2,334	1,608	Pf. Fl. 160	
97	21-1-4W	Stephens	Claud	New	Magnolia	Jones Heirs	2-26	Springer sd.	5,533	5,583		P. 170	Seismograph
94	30-1-5W	Stephens		New gas	McCasland	Russell	11-19	Penn. sd.	1,665	2,535	1,688	Pf. 23,500 M	
117	21-1-12ECM	Texas		Ext.	Phillips	Gayle	8-15	Permian dol.	2,804	2,969	2,905	Pf. A. 1,600 M	
118	32-1-17ECM	Texas		New gas	Phillips	Patkins	10-29	Perm. dol.	2,710	3,110		Pf. A. 13,000 M	Subsurface
90	8-1-19W	Jackson	E. Altus	New	Texas	Holt	11-19	Granite wash	1,419	2,976	1,490	Pf. P. 31-2 Wtr.	Seismograph
98	1-1S-4W	Stephens	Sholem-Alecham	Ext.	Daube et al.	Layn	10-16	Penn. sd.	3,194	4,510		Pf. P. 30	Subsurface
96	10-1S-5W	Stephens	W. Velma	Ext.	Turner	Reveire Est.	10-3	Penn. sd.	2,068	2,097		Pf. P. 63	
95	19-1S-5W	Stephens		New	Amerada	Sledge	12-28	Penn. sd.	2,220	3,623	2,340	S.A. P. 7	
91	31-1S-18W	Tillman	SW. Burt	New	Gulf	Copeland	1-31	Simpson	4,066	4,670	4,585	Pf. P. 119	Seismograph
108	31-2S-2W	Carter	Graham	Ext.	Magnolia	Bennett 15	3-5	Hunton	4,920	5,387		Pf. A. Fl. 597	Subsurface
107	7-2S-3W	Carter	Camp	New	Continental	Dotson	1-10	Springer sd.	6,332	6,487		S.P. 37	Seismograph
92	36-2S-18W	Tillman	S. Frederick	New	Texas	Smith	5-7	Canyon	2,990	5,428		Pf. A. 6-27 Wtr.	Subsurface
109	3-4S-3W	Carter	Healdton	Ext.	Tomlinson	Cities Ser.	5-11	Healdton	1,416	1,462		P. 80	Subsurface
110	10-6S-6	Marshall	NW. Aylesworth	New	Phillips	Gipson	5-7	Bromide	3,346	3,482	3,405	S.A. Fl. 175	Seis. & core
111	19-6S-7	Marshall	Aylesworth	Ext.	Magnolia	Jones	7-16	Bromide	2,969	3,050		S. Fl. 227	Subsurface
112	27-6S-7	Bryan	SE. Aylesworth	New	Amerada	Williams	4-30	Bromide	2,910	3,257		Pf. A. Fl. 167	Seis. & core

* Index numbers refer to Figure 2.
† Under "Type": New—New oil discovery.
New gas—New gas discovery.
Ext.—Extension to old pool.
N. fm.—New producing formation.

‡ Under "Initial Production": Pf.—Perforated.
P.—Pumped.
Fl.—Flowed.
A.—Acidized.
S.—Shot.
M—1,000.
Swb.—Swabbed.
Wtr.—Water.

formations to old fields. Most of the new discoveries are of little importance from the standpoint of reserves. Brief descriptions of a few of the more important oil and gas pools are listed.

NORTH LINDSAY POOL

Another pool was added to the list of Ordovician fields on the flanks of the Anadarko basin when the Cities Service Oil Company completed F. L. Lawson No. 1, center SW. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 22, T. 5 N., R. 4 W., in the southwestern corner of McClain County, in August. Drilled on the basis of a seismograph survey, the well was supported by the Mid-Continent Petroleum Company and the Phillips Petroleum Company. Spudded lated in 1944, it reached the Hunton at 9,636 feet, which was tested by drill-stem test, and encountered an estimated 3 million cubic feet of gas and a little oil. Cores in the Viola, topped at 10,110 feet, revealed slight stain, while the Bromide limestone section carried sufficient stain to warrant a drill-stem test which revealed a little gas and some oil-cut mud. The First Simpson sand was topped at 10,788 feet and yielded 5,000 feet of oil on drill-stem test. The Second sand was reached at 10,872 feet, and electrical survey was run at 10,995 feet, total depth. The $5\frac{1}{2}$ inch casing was cemented at 10,992 feet, with 1,000 sacks of cement. The casing was perforated between 10,943 and 10,990 feet, after which it flowed 2,032 barrels of oil in 40 hours, through $\frac{1}{2}$-inch choke on 2-inch tubing, with 2,900,000 cubic feet of gas. It was completed flowing an average of 29 barrels of oil per hour on $\frac{1}{4}$-inch tubing choke. Gravity of the Second sand oil is 47.4°, corrected. Bottom-hole pressure was 5,175 pounds, with a flowing pressure of 1,950 pounds.

It is of interest to note that drill-stem tests were taken in the Pennsylvanian, Hunton, Viola, Bromide limestone, and First sand, with oil and gas found in every test, and no water encountered in any formation.

The Empire Gas and Fuel Company made a seismograph survey in this area in 1936 and the Cities Service Oil Company resumed work there in 1943 and 1944. Several other companies worked the area with seismograph or gravimeter.

At the close of the year there were two diagonal offsets and one well about $\frac{1}{2}$ mile northeast, all drilling below 6,000 feet.

The participating companies have a block of more than 6,000 acres, extending northwest and southeast across T. 5 N., R. 4 W.

CHITWOOD GAS POOL

A gas field of potential importance was opened when the Magnolia Petroleum Company completed Cunningham No. 1, center SE. $\frac{1}{4}$, SE. $\frac{1}{4}$ of Sec. 33, T. 5 N., R. 6 W., in Grady County. Located about 10 miles east of the Chickasha gas field, and the same distance northwest of, and in the trend of, the Knox field, this

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was producing considerable gas and distillate from the Bromide sand topped at 4,533 feet and plugged back to 4,484 feet from 4,587 feet, total depth. Location was based on a seismograph survey and is between the Pauls Valley pool and the recently discovered East Antioch pool.

well flowed at the rate of 95,700,000 cubic feet of gas daily before being killed because of leak in surface connections.

The Magnolia made a detailed seismograph survey of this area, and spudded the well in early September, 1944. A 7-inch string of protective casing was set at 9,591 feet and cemented with 1,000 sacks of cement. At 10,346 feet a zone of Pennsylvanian sands was encountered which extended to 10,888 feet. Some cores were taken, yielding stained sand with gas odor, and the well tried to blow out a time or two. Electrical survey indicated six sands between 10,346 and 10,888 feet, all of which appeared to be productive. A 1,495-foot $4\frac{1}{2}$-inch liner was cemented at total depth of 10,891 feet, after which the liner was perforated between 10,879 and 10,882 feet, and after running tubing the well flowed 95,700,000 cubic feet of gas with considerable distillate. A leak in surface connections made it necessary to kill the well, after which $5\frac{1}{2}$-inch casing was set and cemented at 9,108 feet. Two and one half inch tubing was run to 10,890 feet, and the well flowed 17,450,000 cubic feet daily on open-flow test, producing an average of $56\frac{1}{2}$ barrels of distillate per million feet of gas. The producing sand is in the Springer (Pennsylvanian) formation. This deep sand has not been tested in the Chickasha gas field.

Two other wells were drilling at the close of the year.

EAST ULAN GAS FIELD

A gas pool of possibly important reserves has been opened in Pittsburg County by the Public Service Company of Oklahoma. The discovery well was Travis No. 1, center, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 5, T. 7 N., R. 14 E., which found 1,400,000 cubic feet of gas in the Booch (Pennsylvanian) sand topped at 1,867 feet. Six other gas wells have been drilled, all to the Booch, with potentials up to 15,000,000 cubic feet of gas daily. Daily potential for the six wells is about 40 million cubic feet. Producing wells are in Secs. 5 and 6, T. 7 N., R. 14 E., and Secs. 31, 32, and 33, T. 8 N., R. 14 E. Two dry holes have been drilled, one between producing wells.

Three miles north of the discovery well, the Public Service also completed a 4,500,000-foot gas well in Van Hoozer No. 1-A, NE. $\frac{1}{4}$, NE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 20, T. 8 N., R. 14 E. This gas is from the Gilcrease sand topped at 3655 feet, although the well went on to 3903 feet. Eight miles southwest of the Travis No. 1 is the 1944 discovery, Public Service's Horton No. 1, SE. $\frac{1}{4}$, NW. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 19, T. 7 N., R. 13 E., which was completed for 1,000,000 cubic feet of gas daily from the Hartshorne sand. One half mile west of Horton No. 1 the Public Service completed Anderson No. 1 in the center, NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 24, T. 7 N., R. 12 E., for 10,000,000 cubic feet of gas from the Hartshorne and Savanna sands.

In addition to the two dry holes in the East Ulan pool, the Public Service has drilled four dry holes in the general area.

This play is based on a surface and subsurface study of the area, which has been extensively faulted.

TABLE IV

IMPORTANT DRY HOLES

Location	*County*	*Company*	*Farm*	*Total Depth (Feet)*	*Deepest Formation Tested*	*Remarks*
6-22N-3W	Garfield	Cities Service	Wilkinson	5,735	Viola	Drilled reversed section from Viola into Woodford into Mississippian. East flank Garber pool
17-19N-10W	Blaine	Superior Calif.	Norris	11,008	Arbuckle	Only Arbuckle test in this area
5-19N-26W	Ellis	Gulf	Kelln	8,886	Penn.	Deep western Oklahoma test on seismograph and gravimeter play
22-13N-7W	Canadian	Trigg	Tennery	10,731	"Wilcox"	Deep test 15 miles west of West Edmond
18-11N-5W	Canadian	Amerada	Lawson	9,541	"Wilcox"	Seismograph play 15 miles west of Oklahoma City field
11-9N-24W	Beckham	Sinclair Prairie	Perkins	7,685	Penn.	Deep test between Erick and Sayre gas fields
26-9N-26W	Beckham	Pure	Hudgins	9,015	Penn.	Deep test southwest of Erick gas field
17-8N-10W	Caddo	Texas	Warden	10,334	Penn.	Deep Anadarko basin test, based on seismograph play
1-8N-17W	Washita	California Company	Reeder	11,130	Penn.	Deep test on south flank Anadarko basin, 12 miles from outcrop of Arbuckle limestone
6-6S-3W	Love	Magnolia	Williams	8,290	Arbuckle	Deep test on seismograph play south of Healdton pool
23-6S-5E	Marshall	Texas	Bounds	9,370	Penn.	Drilled 8,580 feet of Springer shale and stopped in Springer. Bottom-hole core showed approximately vertical dip
25-7S-11E	Bryan	Owen	Hauk	2,784	Simpson (?)	Drilled questionable Simpson section in overlap area between Arbuckle and Ouachita mountains
16-8S-8E	Bryan	Atlantic	Brown	6,676	Penn.	Ouachita mountain facies

EXPLORATORY METHODS

Exploratory work increased both in amount and in types with the re-employment of torsion-balance and magnetometer surveys and the first reported use of a radioactivity survey. Total exploratory work totalled 772 crew months against 559 for 1944, an increase of 38.3 per cent. Seismograph work alone increased 163 crew months or 35.6 per cent, with the number of companies constant at 30. Gravimeter work increased 35 crew months, or 48.6 per cent. The number of seismograph parties in the field varied between 39 in April and 30 again in September and 30 in January. Gravimeter work was at its peak in May with 10 crews active, with the minimum of 3 crews in January. The number of core holes increased 28 per cent, but stratigraphic holes remained constant.

Table V gives a summary of all exploratory work reported for 1941 through 1945.

TABLE V

SUMMARY OF EXPLORATORY WORK 1941 TO 1945

Type	*1945*	*1944*	*1943*	*1942*	*1941*
	Crew Months of Work				
Seismograph	622½	459½	294½	358	281½
Gravimeter	106½	72	66½	83	75½
Torsion balance	5¾				
Magnetometer	23			14	20½
Electrical resistivity					4¾
Radioactivity	2				
Soil analysis					6
Surface detail	12¼	27¾	9½	4¾	7¾
	Number of Holes				
Core drill	270	211	93	105	227
Stratigraphic drill	9	9	16	44	23

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DEVELOPMENTS IN ROCKY MOUNTAIN REGION IN 1945[1]

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ABSTRACT

The total well footage drilled in the Rocky Mountain region increased slightly in 1945 as compared with 1944, but the total number of wells drilled was slightly less.

Oil production increased nearly 5 million barrels with the greatest increase in Colorado due to increased development of the Rangely field. Montana production decreased nearly 250,000 barrels during 1945. Wyoming production increased 3 million barrels, and Colorado's production increased nearly 2 million barrels. At the end of the year Colorado's daily production was nearly equal to that of Montana.

Discoveries were few, except in Wyoming, where the number of new fields found equalled those of 1944.

As detailed figures on production and development are available in the A.I.M.E. *Petroleum Development and Technology* and in Lahee's "Statistics of Exploratory Drilling," this paper largely treats of discoveries and makes recommendations for future prospecting.

INTRODUCTION

This report covers Montana, Wyoming, Colorado, Utah, Nevada, Idaho, most of North Dakota and South Dakota, and the western part of Nebraska.

The Rocky Mountain region had very active development during the war, reaching an all-time maximum in number of wells drilled in 1944, and an all-time maximum in footage drilled and production in 1945.

The increased activity in the Rocky Mountain region resulted from an increased demand for petroleum products during the war, stimulated by a very high discovery rate, especially in Wyoming, as compared with the declining rate elsewhere in the United States. It is to be expected, however, that future activity in the region will subside slowly, because freight rates and transportation are normally unfavorable to the region.

Footage drilled in Colorado more than doubled that of 1944 due to intensive drilling in the Rangely field where 33 Weber sand and 4 shallow shale wells were completed in 1945. Active drilling at Rangely will continue throughout 1946 and probably longer. The success of the Rangely field should stimulate wildcat activities in northwestern Colorado and adjoining parts of Utah.

In the Rocky Mountain region as a whole it is anticipated that wildcat drilling will decrease slightly in 1946 and for several years thereafter.

Production in the Rocky Mountain region reached an all-time high in 1945 but will probably decline slightly in 1946, largely because of unfavorable marketing conditions. Montana's production declined 250,000 barrels in 1945, but this was much more than offset by the 5-million-barrel increase in Wyoming and Colorado.

[1] Manuscript received, March 15, 1946. Presented by title before the Association at Chicago, April 2–4, 1946.

[2] Consulting geologist.

STATISTICS

Table I summarizes drilling activities in the Rocky Mountain region in 1945. with comparative figures for several previous years. Table II gives similar production data. Table III tabulates discoveries in 1945.

TABLE I
Wells Drilled in Rocky Mountain Region in 1945

State	*Successful Wildcats*	*Unsuccessful Wildcats*	*Successful Deeper Pool Tests*	*Unsuccessful Deeper Pool Tests*	*Successful Outpost Wells*	*Unsuccessful Outpost Wells*	*Field Wells*	*Miscellaneous Deepening and Incomplete*	*Total Wells Drilled*	*Total Feet Hole*
Montana	3	24	1	1	2	4	223 Oil 49 Gas	100	407	795,858
Wyoming	10	41	5	4	5	4	146 Oil 13 Gas	92	320	987,473
Colorado	0	13	0	1	0	0	51 Oil 1 Gas	68	134	512,246
Utah	0	2	0	0	0	0	2 Gas	13	17	21,582
South Dakota	0	3	0	0	0	0	0	5	8	20,008
North Dakota	0	0	0	0	1 Gas	0	6 Gas	0	7	9,700
Western Nebr.	0	3	0	0	0	0	0	0	3	15,000
Nevada	0	0	0	0	0	0	0	1	1	565
Total	13	86	6	6	8	8	491	279	897	2,362,432

Total Drilling Activity in 4 States by Years

Year	*Montana*		*Wyoming*		*Colorado*		*Utha*	
	Wells	*Footage*	*Wells*	*Footage*	*Wells*	*Footage*	*Wells*	*Footage*
1942	265	464,858	179	483,025	55	109,125	6	11,807
1943	373	680,145	227	621,936	78	118,364	9	22,066
1944	497	1,030,544	316	961,559	94	246,165	9	7,535
1945	412	795,858	320	987,473	134	512,246	17	21,582

TABLE II
Oil Production in Barrels

State	*1943*	*1944*	*1945*	*Cumulative*
Montana	7,892,205	8,623,264	8,364,090	122,128,602
Wyoming	34,230,711	33,245,333	36,421,158	670,880,660
Colorado	2,363,335	3,075,090	5,030,063	55,511,234
Utah	15,159 (a)	21,557 (a)	20,105 (a)	351,786 (a)
Total	44,501,410	44,965,244	49,835,416	848,872,282

(a) Distillate from Clay Basin gas field.

NEW FIELDS

New fields discovered in the Rocky Mountain region in 1945 total 13. Three of these are extensions to old fields, one is a deeper-pool well, and 9 in Wyoming are new-field discoveries according to Lahee's classification. In this paper, however, all of them have been treated as discoveries.

TABLE III

1945 DISCOVERIES IN ROCKY MOUNTAIN REGION

Operator	Name of Well	County	Location S-T-R	Completion Date	Total Depth (Feet)	Sand Depth (Feet)	Name of Discovery Zone	Name of Field	Initial Production (Barrels per Day)	Type of Discovery
MONTANA										
Carter	Brindley 1	Glacier	12-36N-6W	10/15/45	3,087	3,087	Madison	N. Headlight Butte	50	New field
Consol. Gas	Gillespie 1	Toole	15-35N-4W	4/16/45	2,341	2,341	Madison	W. Kevin	25	New pool
Texas Co.	Ekholt 1	Toole	3-33N-1E	1/30/45	1,656	1,656	Madison	Devon	12	New pool
WYOMING										
Hagemon & Pond	Stanolind Fee	Big Horn	12-51N-93W	11/10/45	3,461	3,450	Tensleep	Lamb	113	New field
Sinclair	Coffman 1	Carbon	21-26N-89W	1/28/45	5,234	5,195	Sundance	Bailey	634	New field
Shannon	State 1	Fremont	16-33N-91W	8/3/45	4,585	3,200	3rd Frontier	E. Muskrat	4 MCF/d	New field
Phillips-Carter	Tribal 1	Fremont	16-5N-2W	9/23/45	6,924	6,280	Phosphoria	Sheldon	1,000	New field
Pacific Western	Eagle OPC 1	Hot Springs	21-43N-92W	1/19/45	4,427	3,600	Phosphoria	Kirby Cr.	60	Deeper pool
Pacific Western	Unit 1 State	Hot Springs	36-44N-93W	12/6/45	4,348	4,348	Phosphoria	Zimmerman	165	New field
Texas Co.	Clark 1	Natrona	35-33N-82W	8/9/45	3,416	2,673	Tensleep	Oil Mtn.		New field
Continental	Goodstein 1	Park	20-57N-99W	7/8/45	7,169	7,169	Tensleep	S. Elk Basin	600	New field
O. C. Howell	Marshall 2	Sublette	34-30N-113W	9/28/45	2,853	2,095	Wasatch	Big Piney	2,000 MCF	Deeper pool

MONTANA

North Headlight Butte.—The Carter Oil Company completed a well in Sec. 12, T. 36 N., R. 6 W., which pumped 50 barrels of clean oil a day from the Madison limestone at a depth of 3,087 feet. This well is 4 miles from production in the Cut Bank field, and could be designated an extension well. As Cut Bank field produces from Kootenai sands of Lower Cretaceous age, and as the new well produces from the deeper Madison limestone, it could also be considered a deeper-pool well.

The North Headlight Butte test was drilled on a low structural nose to determine possibilities of closure on the Madison limestone. As the Cut Bank field is a stratigraphic trap in Kootenai sands and as the North Headlight Butte area is a structural high in the Madison limestone, which is not productive in the Cut Bank field, it is actually a new-field discovery.

West Kevin area.—The Consolidated Gas Company in 1945 completed a well in Sec. 15, T. 35 N., R. 4 W., which pumped 25 barrels of oil and 75 barrels of water a day from the Madison limestone at a depth of 2,341 feet. Although this well is 1½ miles west of production in the Kevin-Sunburst field, it is definitely an extension well, rather than a new-field discovery.

Small pools of this type are characteristic of the Kevin Sunburst field and similar wells and pools will probably continue to be found.

Devon area.—The Texas Company completed a well in Sec. 3, T. 33 N., R. 1 E., which pumped 12 barrels of oil a day from the Ellis sand at a depth of 1,656 feet. This locality is 3 miles east of production in the Kevin-Sunburst field, and is a new extension pool of that field. The Devon gas area lies east of the oil-producing area.

Mosby dome.—A new producing zone in the Jurassic Ellis formation was found in 1945 on Mosby dome by the Schrock-Fifer well No. 1 at a depth of 1,394 feet in Sec. 21, T. 15 N., R. 30 E. Some geologists believe the sand is Morrison rather than Ellis in age in spite of its Marine glauconitic facies.

A deep test well commenced in 1940 on Mosby dome reported a good showing of oil in the new zone and the present development there is the result of that showing.

Mosby dome is the largest local dome on the Cat Creek anticline. However, the principal Cat Creek production was from smaller domes lying farther west. A few wells adjacent to faults produced oil on Mosby dome, however, all previous production came from the Cat Creek sands of Upper Cretaceous and Lower Cretaceous age.

SUMMARY

All of the aforegoing new pools are minor and of the kind that will continue to be discovered in Montana in the future.

The North Headlight Butte field is on a structural nose with probable closure on top of the Madison limestone below a major unconformity. As there are numerous structural noses on the Sweetgrass arch, much future prospecting must be done to exhaust the oil possibilities.

The Kevin-Sunburst field is north of the crest of the Sweetgrass arch, where accumulation of oil and gas is controlled as much by stratigraphic conditions and local porosity as by local structure. The Cut Bank field is a stratigraphic trap on the west flank of the arch.

Many small new pools and isolated wells will probably be found in and around the Kevin-Sunburst area. The shallow depth and low cost of test wells will stimulate wildcatting, although it is doubtful that a systematic drilling program by one company would be profitable.

WYOMING

Wyoming again leads the Rocky Mountain region in the number and importance of discoveries.

Lamb anticline.—Black oil was discovered in the Tensleep sandstone at a depth of 3,460 feet on the Lamb dome in Big Horn County. The structure had previously yielded some gas from shallow sands.

The discovery well was drilled in Sec. 12, T. 51 N., R. 93 W., by Hageman and Pond and produced 113 barrels of oil and 61 barrels of water a day on a short pumping test. A second well completed to the Tensleep was a failure and a third well is being drilled.

Lamb dome is a small structure with very little closure. The fact that oil was found there surprised most of those familiar with the area and again shows the desirability of testing even the least promising prospects.

Bailey dome.—Oil was discovered in the Nugget or Sundance sand at a depth of 5,100 feet on Bailey dome, Carbon County, in December, 1944, and the first well was completed for production early in January, 1945. Five wells have since been completed, one of which is an abandoned dry hole, limiting the productive area, and another discovered oil in the Tensleep sandstone at a depth of 6,970 feet.

The discovery well was drilled in Sec. 21, T. 26 N., R. 89 W., by the Sinclair Oil Company and produced 634 barrels of oil a day on initial test from the Sundance sand. A well drilled on the dome in 1919 found gas in the Frontier sand, but was abandoned when the rig burned.

Bailey dome is on a strongly developed anticline connecting Wertz dome on the northwest with Mahoney dome on the east. The flank closures on the anticline are very large and steeply dipping. The end closures separating Bailey dome from Wertz and Mahoney domes are comparatively shallow, and the limiting closure probably does not exceed 250 feet between Bailey and Wertz.

Bailey dome may develop into an important small oil field, but will not compare in size and importance to the nearby Wertz and Lost Soldier fields.

East Muskrat.—Gas was discovered in the Frontier sands in the East Muskrat field at a depth of 3,200 feet in 1945. The discovery well was drilled in Sec. 16, T. 33 N., R. 91 W., Fremont County, by the Shannon Oil Corporation to a depth of 4,585 feet in the Morrison formation. Seven-inch casing was set on the bottom

and perforated opposite the third Frontier sand at a depth of 3,200 feet. The well yielded an open flow of 3,870,000 cubic feet daily through perforations and was connected with the Central Wyoming Gas pipe-line system. Recently casing has also been perforated opposite the First Frontier sand.

The East Muskrat structure is outlined on the surface by highly distorted and faulted shale beds of Upper Cretaceous age, which are difficult to map accurately and which make seismic interpretations equally difficult. The subsurface structure is probably much faulted, steep-sided and not very large. Additional drilling will be required before the value of the discovery can be determined.

Sheldon dome.—High-gravity black oil was discovered in the Phosphoria (Embar) formation at a depth of 6,280 feet in the Sheldon Dome field during 1945.

The discovery well was drilled in Sec. 16, T. 5 N., R. 2 W., Shoeshone Indian Reservation, Fremont County, by the Phillips Petroleum Company and the Carter Oil Company. The well was drilled to a total depth of 6,924 feet into the Tensleep sandstone. Casing was set near the bottom and the Tensleep, which was tested first, yielded water. The casing was then perforated opposite the upper Embar oil zone and the well produced 470 barrels of oil in 11 hours. Three earlier wells on Sheldon dome produced gas and some light green oil from the Frontier formation. All these earlier wells were abandoned, because there was no market for the gas.

The Sheldon field is a local dome on a long, strongly developed anticline. Other oil fields on the same anticline are Pilot Butte and Steamboat Butte southeast of Sheldon. Several other local domes to the northwest on the same anticline have failed to produce.

Sheldon dome is expressed in surface beds, partially under gravel cover, as a fairly sharp elongate dome. Surface exposures indicate a very large closure on three sides, with shallow closure on the northwest. Seismic work indicates as much as 500 feet of closure on the northwest.

The structure is probably somewhat complicated by faulting. The productive area could include as much as 2,000 acres in which case the dome may develop into an important minor oil field.

Kirby Creek.—Black oil was discovered in the Phosphoria (Embar) formation at a depth of 4,427 feet in the Kirby Creek field in 1944 and was completed for production early in 1945. A second well has since been completed.

The discovery well was drilled in Sec. 21, T. 43 N., R. 92 W., Hot Springs County, by the Pacific Western Oil Company to a total depth of 4,427 feet into the Madison limestone. Completion was made for about 60 barrels of oil a day after acidization of the Embar limestone. The second well was somewhat better than the first.

The Kirby Creek field has had many shallow wells, some of which produce very high-grade light oil from the Frontier sands. The field is classified as a new discovery in the Embar because the amount of light oil produced from the Frontier was negligible.

Kirby Creek field is on an elongate, highly asymmetric, "inside" fold. The south flank dips steeply for a short distance and the total closure does not exceed 350 feet. The drainage area on the north is limited by the similar but more pronounced Lake Creek anticline.

The Embar limestone, as is usual in structures containing only a small accumulation of oil, was very dense and hard. This fact, coupled with the light closure, the limited drainage area of the structure, and the behavior of the wells indicates that Kirby Creek can not be considered commercial at the present time.

Zimmerman Butte.—High-gravity black oil was discovered in the Phosphoria (Embar) formation at a depth of 4,340 feet on the Zimmerman Butte structure late in 1945.

The discovery well was drilled in Sec. 36, T. 44 N., R. 93 W., by the Pacific Western Oil Company. It has an initial production of 165 barrels a day of high-gravity black oil and was drilled only a few feet into the pay zone. Earlier wells drilled in the Zimmerman Butte area, found no oil.

The Zimmerman Butte structure is in an area of soft Cretaceous shale concealed under deep soil. The presence of a closed structure has long been suspected from surface work, but evidently more than simple surface work was necessary to find the high. Pacific Western core-drilled the area and also did some seismic work.

The structure is related to the Kirby Creek structure and is probably a local dome on the same anticline. The area of possible production is probably small, but, because of better position with regard to drainage area, the field may develop into a profitable minor oil field. A second well is reported to have encountered gas and light oil in a shallow sand of the Frontier group.

Oil Mountain.—Heavy black oil of 12° A.P.I. gravity was discovered in the Tensleep sandstone at a depth of 2,675 feet on the Oil Mountain structure.

The discovery well was drilled by The Texas Company in Sec. 35, T. 33 N., R. 82 W., Natrona County, to a total depth of 3,416 feet in Cambrian beds. The well was plugged back to make a small pumper in the upper part of the Tensleep. At least one other well had been drilled on the structure, but did not reach formations below the base of the Cretaceous.

The Oil Mountain structure is a very sharp, elongate dome on the Poison Spider anticline. Other producing fields on the same anticline are Iron Creek on the southeast, Poison Spider, South Casper Creek, and Pine Mountain dome on the northwest. These fields have produced light oil and gas from sands of the Dakota and Sundance formations, also very heavy black oil from the Sundance, Embar, and Tensleep sands. The Pine Mountain dome contains a little gas in the Tensleep.

The Oil Mountain discovery is unimportant and can scarcely be considered commercial. It is unlikely that additional wells will be drilled.

South Elk Basin.—Oil was discovered in the Tensleep sandstone at a depth of 6975 feet during 1945 on the South Elk Basin structure.

The discovery well, Ida Goodstein No. 1, was drilled in Sec. 20, T. 57 N., R.

99 W., by the Continental Oil Company into the Amsden formation at a total depth of 7,169 feet. The entire thickness of the Tensleep sandstone was thoroughly saturated and the well produced 600 barrels of clean oil a day.

Since the Ida Goodstein No. 1 completion, a second oil well has been drilled to the Tensleep and another well produces gas from a shallower zone. Drill-stem tests indicated gas in the Peay sand of the Frontier, the Dakota sand, Lakota sand, and the Sundance.

The Union Oil Company drilled a low well on the east side of the field to a depth of 3,452 feet, which gives valuable structural information.

The Kirk Oil Company drilled a stratigraphic test $2\frac{1}{2}$ miles south of the Ida Goodstein well No. 1 to a depth of 2,032 feet, which also gives valuable structural information, but the reliability of the data as interpreted is doubted by many because it does not conform to seismic results.

The South Elk Basin field is the south-plunging end of the Elk Basin anticline. The surface for the most part is deeply buried under a thick mantle of terrace gravel.

Surface and well data suggest that a fault of several thousand feet throw may separate South Elk Basin from the Main Elk Basin field.

Some surface data and much of the seismic data indicate a small local high with the Ida Goodstein well No. 1 at the center on the south plunging axis of the Elk Basin anticline. However, data from the Kirk stratigraphic test refute this, if correctly interpreted, and indicate that the structure is higher $2\frac{1}{2}$ miles south of the Ida Goodstein well No. 1. As stated, the seismic data indicate a south-plunging anticline with very small local highs superimposed.

In all probability, the South Elk Basin area is as complexly faulted as Elk Basin proper; in fact, it may consist of several small domes on the plunging axis, as indicated by seismic data. If a most liberal interpretation is made of the results of the Kirk stratigraphic test, a field as large as the main Elk Basin field could be present.

Much more drilling is necessary before South Elk Basin can be definitely classified as a small local minor pool or a major oil field. In the writer's opinion, it is most interesting prospect in the Rocky Mountain region.

Big Piney.—Gas was discovered in 1945 at a depth of 2,095 feet in a well drilled to 2,853 feet in Sec. 34, T. 30 N., R. 113 W. The well made 2,000,000 cubic feet gas a day from a sand in the Tertiary Wasatch formation. A previous well 2 miles southeast produced gas from a sand at 950 feet also in the Wasatch formation.

NEW PRODUCING SANDS AND ZONES

The wildcat discoveries in the Rocky Mountain region in 1945 opened no new producing sands or zones.

The North Headlight Butte discovery in Montana, 4 miles from the Cut Bank field, opened a new producing zone (Madison) for the field, but not a new zone for the region.

All other Montana discoveries opened new pools in the same sands that have previously produced on the Sweetgrass arch.

The nine discoveries in 1945 credited to Wyoming produce from sands or zones previously productive in the region.

EXTENSIONS TO KNOWN FIELDS (OUTPOSTS)

In Montana, the B. R. Gainer well, Sec. 4, T. 15 N., R. 29 E., ½ mile west of previous production in the Cat Creek field, encountered good showings thought to be commercial. The well was probably located on the west side of a fault. All Cat Creek sand accumulation in the Cat Creek field is controlled by faults crossing the axis. Where these faults are close together, the productive area merges into a pool, as on west dome; where the faults are farther apart, production is limited to a narrow band bordering the west side of the faults.

In Wyoming, a second Tensleep sand well in the Big Sand Draw field is listed as an outpost well, because it produced oil 500 feet lower on structure and is separated by a fault from the discovery well completed in 1944. When located, it was thought that the second well would be as high as, or higher on structure than, the first one.

A second well on the Beaver Creek structure, Fremont County, is listed as an outpost gas well, because it is nearly a mile from the discovery well. It is higher on structure than the first, and was drilled as a routine development well.

A downdip well in the Hamilton Dome field, Hot Springs County, is listed as an outpost. It was drilled to find the limits of production in the Embar and Tensleep sands. Both sands contained water, but the well was completed as a small producer from the Curtis sand in the Chugwater redbeds.

A well on Waugh dome is listed as an outpost well, because it is ¼ mile from an abandoned producer. The new well is much higher on structure than earlier wells and produces 28°-gravity black oil.

IMPORTANT WILDCATS—UNSUCCESSFUL

One of the most important areas for future prospecting in Montana is the disturbed belt bordering the eastern edge of the Cordilleran syncline. The same or similar trend extends southward through Wyoming into northwestern Colorado and eastern Utah.

The Union Oil Company drilled a dry hole on the Willow Creek structure, and two other tests, one by the Carter Oil Company on the Milk River structure, and another by the General Petroleum Company farther south and west, are incomplete. Regardless of the outcome of these tests, the disturbed belt holds great prospects for production despite the extreme difficulty in locating subsurface structure.

Another area of importance in northern Montana for Devonian production lies east of the Sweetgrass arch. Several wells, however, tested the Devonian here in 1945 without success.

The central Montana basin extending into the Dakotas and filled with Big Snowy deposits holds prospects for stratigraphic traps. The Huntley well near Billings, which was drilled in 1945, failed to find porosity. Also it was not drilled deep enough for a complete test.

One of the most interesting deep-test failures drilled in Wyoming during 1945 was the Kirk deep well in Oregon Basin. This well tested all formations down to pre-Cambrian granite on one of the largest structures in the state. The basal Cambrian sandstone (Flathead) yielded light-oil-saturated cores but the sand failed to produce. The well was completed as a producer in the Madison limestone.

Regardless of failure, findings in the Kirk well indicate the importance of testing all promising structures in northern Wyoming and central Montana to granite.

Two unsuccessful deep wells in northwestern Colorado are also of interest. The Stanolind Oil and Gas Company's well on Meeker dome, which was drilled to a depth of 6645, reached the Devonian without finding notable showings of oil or gas. This test, however, contributed important information on the stratigraphy.

A deep test in the Wilson Creek field reached a total depth of 12,702 feet without finding production in the Pennsylvanian and Mississippian. This well has an important bearing on future developments at Rangely.

A deep well on the Neiber dome in Washakie County, Wyoming, reached a depth of 5347 feet in 1945, where a gas blow-out occurred. The resulting fire destroyed the drilling equipment and delayed further progress for several months.

The River dome well at Worland discovered gas and distillate in the Frontier sands and similar showings in the Muddy and Dakota sands. At the present writing the well has reached the Ordovician, and is being plugged back for testing the Embar and Tensleep zones.

These wells are especially interesting because they are tests of structures defined by geophysics and located far out in the deep basins.

EXPLORATORY METHODS AND RESULTS

The Sweetgrass arch is a large structural feature extending many miles into Canada. Accumulation is controlled by a combination of stratigraphy and local porosity with local structure. Sporadic drilling based on any kind of exploratory work that can be applied is the method used in finding new pools. Subsurface study of the stratigraphy, surface work, and geophysical methods are most effective tools.

To date, surface and subsurface geology have been almost the sole means of locating new structures in Wyoming. Geophysical methods used alone, in the opinion of many, are relatively unsuccessful. The seismograph, however, has been successful when used in close conjunction with surface and subsurface geologic work.

In Wyoming, the search for stratigraphic traps has not gained much momentum; probably because so few fields of this type have been found. Stratigraphic

studies should be given more attention in the future, and are particularly adapted to the search for Tertiary Wasatch production in southwestern Wyoming and northwestern Colorado.

The discoveries in the Rocky Mountain region should be credited to a combination of exploratory methods, approximately in the following order.

1. Surface and subsurface geology
2. Surface geology and regional trends
3. Surface geology and seismograph
4. Subsurface stratigraphy
5. Seismograph and gravimeter
6. Other geophysical methods, which to date have yielded negligible results

The following tabulation shows the type of exploratory work used preceding the 1945 discoveries.

North Headlight Butte	Surface geology and seismograph
West Kavin	Trend
Devon Area	Surface geology and trend
Lamb Anticline	Surface geology
Bailey Dome	Surface geology, subsurface
East Muskrat	Surface geology and trend
Sheldon	Surface geology and seismograph
Kirby Creek	Surface geology
Zimmerman Butte	Trend, core drilling, surface geology
Oil Mountain	Surface geology
South Elk Basin	Trend, seismograph
North La Barge	Trend, subsurface geology
North Dry Piney	Trend

Most plays by the larger companies are surface structures checked by seismograph before drilling. To date, the final checking of the subsurface by the seismograph is the most important contribution of geophysics to the science of oil discovery in the Rocky Mountain region.

TABLE IV
EXPLORATORY PARTIES OPERATING IN 1945

	Montana			*Wyoming*			*Colorado*			*Utah*		
	A	B	C	A	B	C	A	B	C	A	B	C
Seismograph	45	8	1	204	30	3	39	6	1	9	2	1
Gravity meter	4	2	1	165	23	5	20	3	1	33	5	1
Magnetometer				1	1		1	1				
Core drills		1			5			3			1	
Geological Surface parties	10			25			10			5		

A, Field months of work done.
B, Maximum number of parties.
C, Minimum number of parties.

TREND IN EXPLORATION, DRILLING AND LEASING

Wildcat drilling will probably increase in Montana and Utah in 1946 and should decline only slightly in Wyoming and Colorado.

All present types of geophysical surveying will show a marked decline through-

out the region, unless new developments increase the efficiency and application.

Leasing activities probably reached a maximum in 1944 and 1945 and should decline because few lands are left to lease.

The discovery of new prospects for leasing and development is at a declining rate.

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DEVELOPMENTS IN TEXAS PANHANDLE IN 1945[1]

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ABSTRACT

The Panhandle district includes the twenty-six northwestern counties in Texas. Ten of these counties produce oil or gas.

The major structural features include the Amarillo uplift, the Anadarko basin, the Permian basin, the Bravo dome, the Stratford dome, the Dalhart basin, and the Bush dome.

There was a decided increase in drilling operations for 1945 as compared with 1944. In all, 516 wells were completed in 1945; 317 of these were gas wells, 159 were oil wells, and 40 were dry and abandoned. Most of the activity was concentrated on developing the gas acreage in southeastern Hartley, western Moore, Sherman, and northwest Hansford counties.

No new fields or producing formations have been discovered. However, the Phillips Petroleum Company's Shirk No. 1, located northeast of the Stratford dome had a showing of oil in a lower Pennsylvanian sand.

In 1945 the Texas Panhandle produced more than 31 million barrels of oil from 6034 wells. This is a decline of approximately 3 million barrels from the 1944 production. The cumulative production in the area to the end of 1945 is 535 million barrels.

The leasing during 1945 falls into two categories, one a consolidation of gas acreage, and the other a lease play in the Anadarko basin.

The consolidation of leases into units of 640 acres was confined to Moore, Sherman, and Hansford counties.

Extensive geophysical work in the Anadarko basin has resulted in a large amount of leasing. This lease play begins in the southwest part of Lipscomb County and extends in a northwest direction across Ochiltree County and into the Oklahoma Panhandle. This leasing is based on the possibility of producing oil and gas from zones of pre-Permian age. The Anadarko basin play added more than ½ million acres to the leases held in 1945.

INTRODUCTION

The Panhandle district, including the twenty-six northwesterly counties in Texas, is bounded on the north and east by Oklahoma and on the west by New Mexico. The south boundary of the area is formed by the south line of Parmer, Castro, Swisher, Briscoe, Hall, and Childress counties. Ten of the counties in the district produce oil or gas or both.

TABLE I

CLASSIFICATION OF WELLS DRILLED IN 1943, 1944 AND 1945

	Total	*Oil*	*Gas*	*Expl.*	*Ext.*	*Dry*
1945	516	159	317	17	0	40
1944	338	244	63	12	1	31
1943	177	124	30	5	0	23

The major structural features of the district include the Amarillo uplift, the Anadarko basin, the Permian basin, the Bravo dome, the Stratford dome, the Dalhart basin, and the Bush dome. The Amarillo uplift and the Bravo dome extend generally east and west through the middle of the district. The Anadarko basin is on the northeast and the Dalhart basin on the northwest with the

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[2] Stanolind Oil and Gas Company. The writers wish to acknowledge their indebtedness to the Amarillo Oil Scouts for contributing the information for this paper.

Stratford dome between them. The Permian basin is south of the ridge. The Bush dome is in central Potter County, in the west-central part of the district.

DEVELOPMENTS

Drilling operations for the year increased over those of 1944. In all, 516 wells were completed in 1945: 317 were gas wells, 159 were oil wells, and 40 were dry and abandoned.

TABLE II

ACREAGE UNDER LEASE IN THE PANHANDLE DISTRICT

County	*1944*	*1945*
Armstrong	10,926	0
Briscoe	13,515	11,015
Carson	111,654	115,875
Castro	8,351	7,141
Collingsworth	29,955	23,826
Dallam	137,580	119,500
Deaf Smith	13,558	13,558
Donley	81,777	20,247
Gray	138,362	165,605
Hall	34,263	30,790
Hansford	320,108	323,878
Hartley	48,972	263,607
Hemphill	18,887	54,119
Hutchinson	158,275	149,026
Lipscomb	42,513	130,450
Moore	324,335	375,041
Ochiltree	107,621	194,572
Oldham	129,067	20,000
Parmer	27,819	360
Potter	20,815	12,240
Randall	10,547	10,547
Roberts	50,567	59,709
Sherman	451,753	425,049
Swisher	17,245	29,151
Wheeler	84,916	84,916

TABLE III

SUMMARY OF HOLES COMPLETED IN 1945

County	*Total Wells 1945*	*Total Footage*	*Total IP in Million CF*	*Total IP in Bbls.*	*Dry Holes*	*Gas Wells*	*Oil Wells*
Carson	27	78,034	186.60	1,154	2	12	13
Childress	3	17,957	0	0	3	0	0
Collingsworth	3	7,239	3.25	0	1	2	0
Dallam	2	9,637	0	0	2	0	0
Deaf Smith	1	7,805	0	0	1	0	0
Donley	1	4,092	0	0	1	0	0
Gray	91	270,868	149.20	11,360	9	17	65
Hansford	69	204,786	383.30	0	4	65	0
Hartley	34	122,188		0	2	32	0
Hutchinson	84	260,670	138.30	7,767	3	11	70
Moore	131	441,114	3,372.50	38	1	128	2
Ochiltree	1	6,200	0	0	1	0	0
Potter	5	15,731	84	0	3	2	0
Sherman	41	135,148	319.60	0	2	39	0
Wheeler	23	61,005	55	479	5	9	9
Total 1945	516	1,638,440	5,659.70	20,798	40	317	159
Total 1944	337		992.80	32,746	30	63	244

TABLE IV

IMPORTANT WELLS DRILLED IN PANHANDLE DISTRICT IN 1945

County	Company	Farm	Location			Total Depth (Feet)	Penetration	Results	Remarks
			Sec.	Blk.	Surv.				
Childress	Texas Co.	Farmers and Merchants 1	644	H	W&NW	7,618		DA	
	Ohio	Gibson 1	484	H	W&NW	7,374		DA	
Dallam	Texas	Capitol Free-hold Land 1	10	7	CSS	6,169	Pre-Camb.	DA	Deep test on west side of Dalhart basin. Miss. absent
	Shamrock	Hester 1	355	1-T	T&NO	3,468	Permian	DA	Brown dolomite test on west side of Stratford dome
Deaf Smith	Humble	Hyslop 1	18	T3N-R1	ECM	7,805	Pre-Camb.	DA	Miss. and Ellenburger absent
Donley	Stanolind	Lewis 1	81	E	D&P	4,092	Pre-Camb.	DA	Miss. and Ellenburger absent. Granite wash and detrital material underlying Brown dolomite
Hartley	Pure	Skalsky 1	T. B. Russell Survey			4,034	Permian	DA	Brown dolomite test
Ochiltree	Flynn	Hoover 1	213	43	H&TC	6,200	Penn.	TA	
Wheeler	Sinclair-Prairie	Henderson 1	16	A-8	H&GN	8,514	Penn.	DA	Granite wash from 2,850 to 7,130 ft.; Granite wash and re-worked Ord. to 8,430 ft.; Granite wash and re-worked Miss. or Dev. to total depth
	Sinclair-Prairie	Mills 1	18	A-7	H&GN	4,754	Penn.	DA	Reached Granite wash at 4,600 ft. Structurally 2,600 ft. lower than producing zone on Amarillo ridge 6 miles south
Hansford	Phillips	Elton 1	155	2	GH&H	Drilling			Brown dolomite water-bearing. Deep test now drilling below 3,900 ft.
	Phillips	Sharer 1	210	2	GH&H	3,187	Permian	DA	Brown dolomite water-bearing
	Phillips	Racol 1	116	2	GH&H	3,135	Permian	1.6MCF	
	Phillips	Pearson-Hitch 2	288	2	GH&H	3,525	Upper Penn.	6.4MCF	Oil test below Brown dolomite gas-producing zone
	Phillips	Harvey 1	280	2	GH&H	3,107	Permian	DA	Showing of gas and water in Brown dolomite
Sherman	Humble	Pronger 1	317	1-T	T&NO	5,346	Middle Penn.	Temp. Aban.	Northwest side of Stratford dome
	Phillips	Ezra 1	198	1-C	GH&H	5,158	Middle Penn.	4.5MCF	
	Phillips	Louise 1	281	1-T	T&NO	3,965	Upper Permian	22.7MCF	North extension of Stratford dome deep gas
	Phillips	Omar 1	144	1-T	T&NO	4,584	Middle Penn.	Temp. Aban.	Brown dolomite dry
	Phillips	Shirk 1	174	1-T	T&NO	7,014	Ord.	0.75MCF	Showing oil at 5,800 ft. in basal Penn. sand; PB to Brown dolomite
	Phillips	Van Der Ploeg 1	23	3-T	T&NO	3,357	Permian	0.99MCF	
	Shamrock	Bywaters 1	421	1-T	T&NO	3,376	Permian	2.3MCF	Southwest side of Stratford dome
		Price 3	20	2-B	T&NO	3,375	Permian	11.5MCF	Eastern extension of commercial gas production
Potter	Warner	Bush 1	12	20-F	EL&RR	4,739	Permian	DA	West part of Bush dome
	Warner	Bush 2	12	M-19	G&M	4,005	Permian	DA	Northwest part of Bush dome

During the year emphasis was placed on developing the gas area in southeastern Hartley, western Moore, Sherman, and northwestern Hansford counties. No new fields or producing formations were discovered. However, the Phillips Petroleum Company's Shirk No. 1, in Sherman County northeast of the Stratford dome, had a showing of oil in a lower Pennsylvanian sand.

LEASING

The trend in leasing during 1945 falls into two categories: one a consolidation of gas acreage, the other a lease play in the Anadarko basin. The consolidation of leases into units of 640 acres was confined to Moore, Sherman, and Hansford counties. Extensive geophysical work in the Anadarko basin has resulted in a large amount of leasing. The lease play extends from the southwest part of Lipscomb County in a northwesterly direction across Ochiltree County, includes a part of Hansford County, and extends into the Oklahoma Panhandle. This leasing activity is based on the possibility of finding producing zones of pre-Permian age. The Anadarko basin play added more than ½ million acres to the leases held in 1945.

TABLE V

CREW-MONTHS OF GEOPHYSICAL OPERATION

County	*Magnetometer*	*Gravimeter*	*Seismograph*	*Core Drill*
Armstrong	1.5	2		
Briscoe	1.5	5		
Castro	1.0	6		
Childress	1.0	6.5	1	3
Collingsworth	1.5	3		
Dallam	3.0			1.5
Deaf Smith	4.0	2	2.5	
Donley	1.5	2		
Gray				2.5
Hall	1	3.5		
Hansford	2.5		1	3.5
Hartley	2		2	3.5
Hemphill	3	2	2.5	
Lipscomb	4	3.5	11	
Moore	2			3.5
Ochiltree	4	4	11	
Parmer	2	2.5		
Potter	3			
Randall	3	1		
Roberts	2	1.5	8.5	
Sherman	2.5			3
Swisher		7		
Wheeler	1		2	
	47	51.5	91.5	20.5

NEW PUBLICATIONS

Six geological and development papers were published during the year. One paper by Anthony Gibbon reviewed the development in the eastern Anadarko basin and its relation to the Panhandle. E. W. Fosshage published a geological note on the Arbuckle test in east-central Moore County. A. J. Crowley and Leo

Hendricks included one well in Childress County in their study of the Lower Ordovician and Upper Cambrian of north-central Texas. C. R. Wagner prepared the annual development paper for 1944. L. T. Patton wrote on the igneous rocks found in several deep tests. The development paper by the Amarillo Oil Scouts included a paper by E. W. Fosshage on the western flank of the Anadarko basin. K. B. Barnes summarized the repressuring projected planned for the West Pampa pool in northwest Gray County.

FOSSHAGE, E. W., "Recent Deep Test in Moore County, Texas," *Bull. Amer. Assoc. Petrol. Geol.* Vol. 29, No. 2 (February, 1945), pp. 227–29.

WAGNER, C. RICHARD, "Developments in Texas Panhandle in 1944," *ibid.*, Vol. 29, No. 6 (June, 1945), pp. 721–24.

PATTON, L. T., "Igneous Rocks from Deep Wells in West Texas," *ibid.*, Vol. 29, No. 7 (July, 1945), pp. 1028–34.

CROWLEY, A. J., and HENDRICKS, LEO, "Lower Ordovician and Upper Cambrian Subsurface Subdivisions in North Central Texas," *ibid.*, Vol. 29, No. 4 (April, 1945), pp. 413–25.

GIBBON, ANTHONY, "Great Activity for Anadarko Basin in 1945," *Oil Weekly* (January 8, 1945), pp. 20–24.

AMARILLO OIL SCOUTS, "Texas Panhandle Oil and Gas Field Development 1944," *National Oil Scouts and Landmen's Association Year Book* (Austin, Texas), pp. 720–34.

BARNES, KENNETH B., "Mammoth Gas-Repressuring Project to Start in West Pampa Pool," *Oil and Gas Jour.* (February 10, 1945), pp. 74–79.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6 (JUNE, 1946), PP. 930-957, 1 FIG.

DEVELOPMENTS IN WEST TEXAS AND SOUTHEASTERN NEW MEXICO IN 1945[1]

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ABSTRACT

West Texas.—In all, 1,744 wells were completed in 1945, more than in any year since 1941 and 72 more than in 1944. Of the 278 exploratory wells, 47 were completed as producers of oil or gas. Ten new Permian pools and 20 new pre-Permian pools were discovered.

Andrews County was the most active county, with 364 wells drilled, including 219 in the Fullerton field; and most prolific with Devonian production found in the Bedford, Dollar Hide, Fullerton, and Three Bar pools; Simpson production in the Martin 8,700 pool; and Ellenburger in the Bedford and Fullerton pools. The TXL pool in Ector County was the most active newly discovered pre-Permian pool, with 40 producers and 2 dry holes completed in the Devonian (8,000 feet), and 11 producers completed in the Ellenburger (9,800 feet), together with 29 wells drilling at end of 1945. In Crane County, 12 wells were drilling around the new dually completed Devonian and Ellenburger discovery well in the Block 31 pool. Silurian and Devonian oil was found in Winkler County and Ellenburger oil in Crockett County. Forty-six producers and 1 dry hole were completed in the Keystone Ellenburger (10,000 feet) Winkler County pool in 1945.

Pipe-line runs were 175,540,000 barrels in 1945, an increase of 14,760,000 barrels over 1944, the highest previous year. Production from 40 pre-Permian pools increased from 4.92 per cent of the total in January to 11.39 per cent in December.

New Mexico.—In all, 393 wells were completed in 1945, including 67 exploratory wells of which 19 were producers, resulting in discovery of 9 new Permian fields, of which Paddock was most outstanding; and 1 pre-Permian, Brunson (Ellenburger 8,000 feet). Pipe-line runs for 1945 were 36,870,000 barrels, a decrease of 2,160,000 barrels from 1944.

INTRODUCTION

The West Texas and Southeastern New Mexico district as used in this report comprises 51 counties in Texas, including Motley, Dickens, Kent, Scurry, Mitchell, Coke, Tom Green, Concho, Menard, Kimble, Sutton, Crockett, Terrell, and all counties on the west; and 7 counties in New Mexico, namely, Lea, Eddy, Chaves, Roosevelt, De Baca, Lincoln, and Otero.

The base map (Fig. 1) used in previous years has been revised and brought down to date as of December 31, 1945. Tables I and II, a columnar section tabulation of producing fields in West Texas and New Mexico arranged in order by producing formations, counties, and fields, include latest names of all fields carried on the reports of the State regulatory bodies. Names of stratigraphic units in this report are those commonly used in the area. Subsequent information will probably change many of them. It is interesting to note in West Texas that oil

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[3] Geologist, The Texas Company.

[4] Geologist, Standard Oil Company of Texas.

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is produced from each of the Paleozoic systems with the sole exception of the Mississippian.

Some overlapping of data with previous years occurs because this list of new discoveries of 1945 includes all wells that were officially completed in 1945, regardless of when the first oil showings or tests were reported. Only those wells considered of special importance are included in the tables of completed and drilling wells. Many others which have no special structural or stratigraphic interest are omitted even though they may have tested the Ellenburger. Some wells listed in the drilling table in 1944[5] had reached total depth but were completed in 1945 with no essential change in data and are not given in this report.

Development—General

The combined drilling activity in West Texas and New Mexico in 1945 was greater than that in 1944, with 60 more wells drilled, and the greatest of any year since 1941. The added activity of both drilling and production in West Texas more than took care of the decline in New Mexico as shown in Tables III and IV. However, drilling activity was declining as the year closed.

The 20 new pre-Permian and 10 Permian pools discovered in West Texas continued the trend toward deeper drilling established in 1944.

More than 212 million barrels of oil were produced in 1945, a total increase of 12.6 million barrels over 1944. The 1945 peak production record may stand for some time. The peak producing month in West Texas was July when production reached 520,048 barrels of oil daily making a monthly total of 16,121,488 barrels. The peak month in New Mexico was March when 3,199,107 barrels of oil were produced, a daily average of 103,197 barrels.

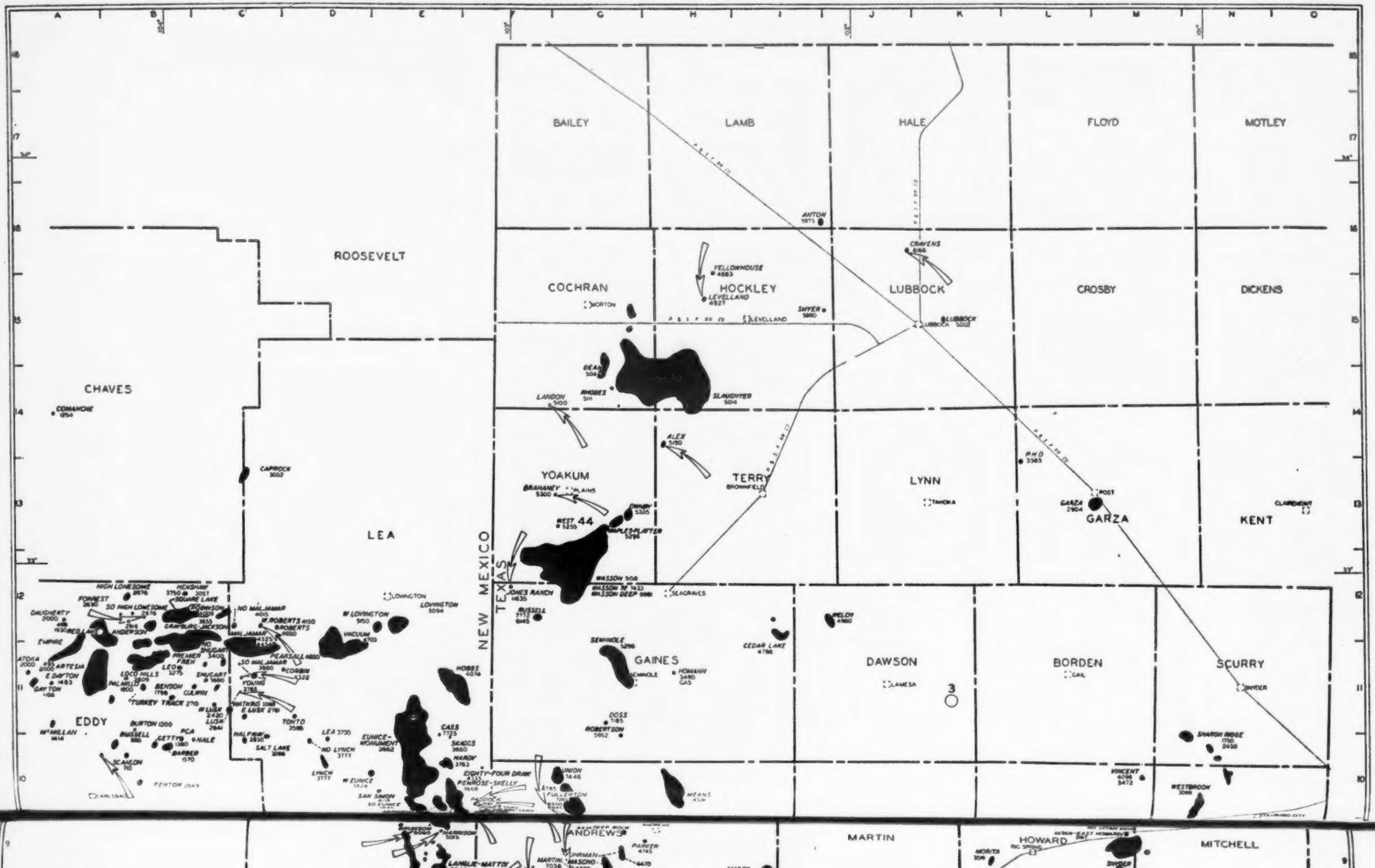
The importance of pre-Permian oil in West Texas is shown by the increase from 4.92 per cent of the total production in January to 11.39 per cent of the total production in December. Forty pre-Permian fields were producing at the end of the year. Larger allowables due to depth and selective buying together with continued deep drilling and development should continue this trend.

Loading racks installed to meet wartime demand were being dismantled as the year closed.

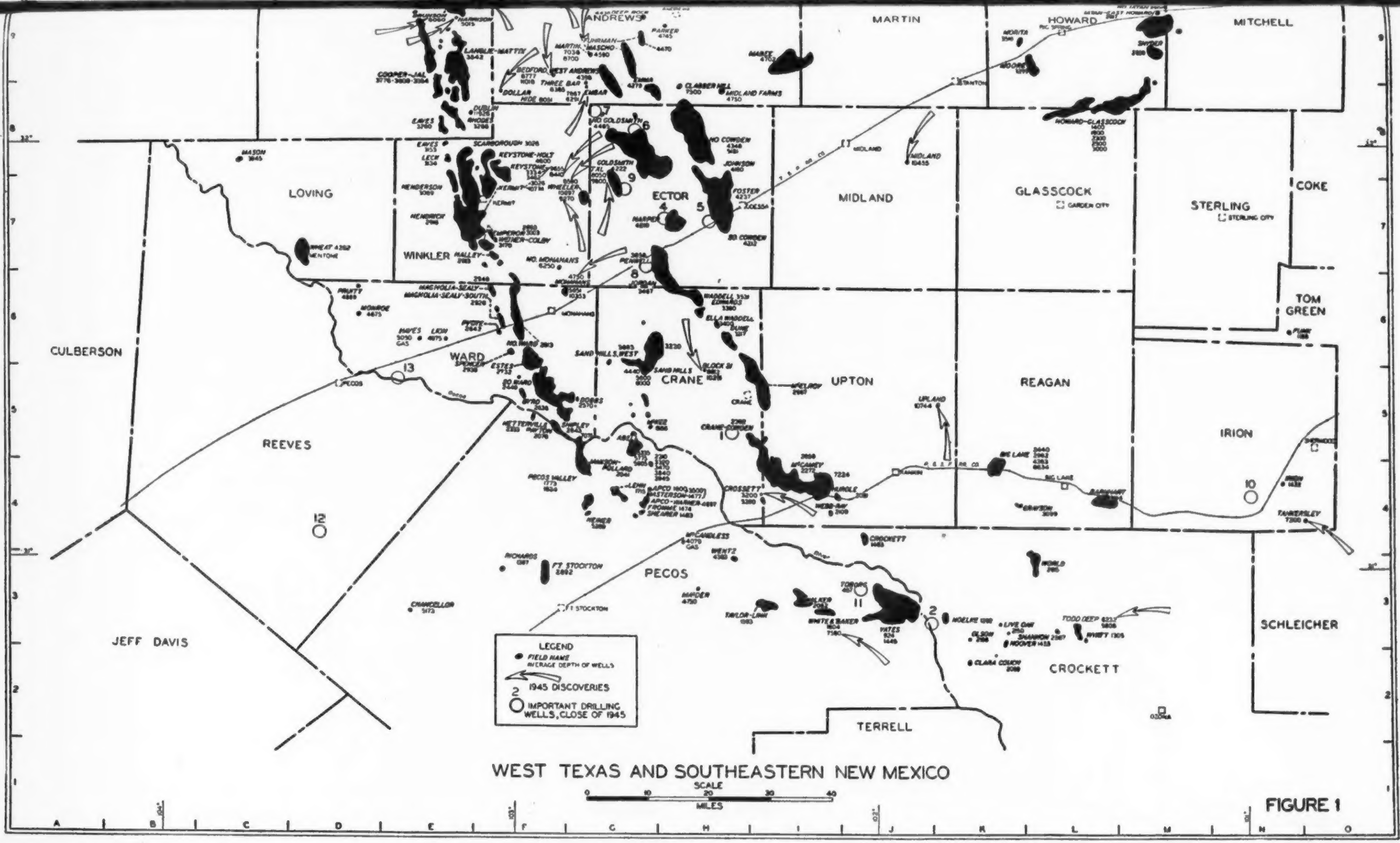
Developments in Permian of West Texas

The predominance of pre-Permian exploration, well begun in 1944, increased sharply during 1945, with a corresponding decrease in Permian exploration. Most Permian exploratory wells were drilled in the northern and eastern parts of the area where the pre-Permian formations are very deep and the exploration costs and hazards are excessively high. Gaines, Martin, Howard and Mitchell counties and the counties north of them have received a large share of Permian exploration. The developments in the counties on the south can be divided into

[5] Sam C. Giesey and Henry G. Raish, "Developments in West Texas and Southeastern New Mexico in 1944," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), pp. 725–56.



BAILEY
LAMB
HALE
FLOYD
MOTLEY
ROOSEVELT
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
DICKENS
CHAVES
YOAKUM
TERRY
LYNN
GARZA
KENT
LEA
NEW MEXICO
TEXAS
GAINES
DAWSON
BORDEN
SCURRY
EDDY
ANDREWS
MARTIN
HOWARD
MITCHELL



WEST TEXAS AND SOUTHEASTERN NEW MEXICO
SCALE
MILES
FIGURE 1
LEGEND
FIELD NAME
AVERAGE DEPTH OF WELLS
1945 DISCOVERIES
IMPORTANT DRILLING WELLS, CLOSE OF 1945
CULBERSON
LOVING
WINKLER
ANDREWS
MARTIN
HOWARD
MITCHELL
ECTOR
MIDLAND
GLASSCOCK
STERLING
COKE
TOM GREEN
WARD
CRANE
UPTON
REAGAN
IRION
REEVES
PECOS
JEFF DAVIS
CROCKETT
SCHLEICHER
TERRELL

Fig. 1

TABLE I
PRODUCING FIELDS, WEST TEXAS
(1945 discoveries in capitals)
(December 31, 1945)

Age	*Formation*	*County*	*Field and Coordinate*
Cretaceous		Pecos	Toborg J-3 (Toborg pay)
Permian	Dewey Lake	Pecos	Richards F-3
	Delaware Mtn.	Loving	Mason G-8, Wheat D-7
		Pecos	Chancellor E-3
		Ward	Lion E-6, Monroe D-6
	Yates	Andrews	Fullerton G-10 (Gas Field) Shafter Lake (Gas Field)
		Gaines	Homann H-11 (gas field)
		Glasscock	Howard-Glasscock L, M-8
		Howard	Howard-Glasscock L, M-8
		Pecos	Fort Stockton F-3, Netterville F-5, Pecos Valley (HG)G-4, Pecos Valley (LG) G-4, Taylor Link I-3
		Ward	Byrd F-5, Magnolia Sealy F-6, Magnolia Sealy, South F-6, Payton F-5, Pyote F-6, Spencer F-6, Ward North Estes F-6, Ward, South F-5
		Winkler	Eaves E-8, Emperor F-7, Halley F-7, Henderson F-7, Hendrick E, F-7, 8, Kermit F-7, 8, Leck E-8, Scarborough E-8
	Seven Rivers	Crockett	Noelke K-3
		Howard & Glasscock	Howard-Glasscock L, M-8
		Pecos	Jamison-Pollard G-5, Shearer G-4
		Ward	Magnolia Sealy F-6, Magnolia Sealy, South F-6, Ward North Estes F-5, 6, Ward, South F-5
		Winkler	Eaves E-8, Emperor F-7, Emperor (Deep) F-7, Halley F-7, Henderson E-7, Hendrick E-F-7, 8, Kermit F-7, 8, Leck E-8
	Queen	Crockett	Hoover K-3
		Pecos	Fromme G-4, Lehn & Apco 1600 G-4, Masterson G-4, Taylor Link I-3, Walker I-3, White & Baker I-3
		Reagan	Big Lake K-4
		Ward	Dobbs G-5, Shearer G-4, Shipley G-5, Ward, North-Estes F-5, 6, Ward, South F-5
		Winkler	Keystone-Colby F-7, 8, Weiner Colby F-7
	Grayburg	Andrews	Mabee I-9, Fuhrman Mascho G-9, West Andrews G-9
		Crane	Cowden, Crane I-5, Dunes H-6, Edwards H-6, McElroy I-5, Waddell H-6, Waddell, Ella H-6
		Crockett	Clara Couch K-2, Crockett J-4, Olson K-3, Shannon L-3, World L-3
		Ector	Cowden, North H-8, Cowden, South H-7, Foster H-7, Goldsmith G-8, Johnson H-8, Jordan H-6
		Glasscock	Howard-Glasscock L, M-8
		Howard	Howard-Glasscock L, M-8, Moore L-9
		Pecos	White & Baker-Lime I-3, Yates-Smith Sand J-3
		Upton	Hurdle I-4, McCamey I-4, McElroy I-5, Webb Ray I-4
		Winkler	Keystone Lime F-7, 8

TABLE I—(*continued*)

Age	*Formation*	*County*	*Field and Coordinate*
	San Andres	Andrews	Clabberhill H-8 (Holt pay), Deep Rock G-9, Emma G, H-8, Fuhrman Mascho G-9, FULLERTON SAN ANDRES, G-9, Means H-10, Parker H-9, West Andrews G-9
		Cochran	Dean G-15, LANDON F-14, Rhodes G-14, Slaughter H-14
		Crane	Sand Hills McKnight G-6
		Crockett	Clara Couch K-2, Live Oak K-3, Wyatt L-3
		Dawson	Welch J-12
		Ector	Cowden, North H-8, North Cowden Deep H-8 (Holt Pay) Foster H-7, Goldsmith G-8, Goldsmith, North G-8, Harper H-7, Jordan H-6, Penwell H-7
		Gaines	Cedar Lake I-12, Seminole G-11, Wasson F, G-12
		Garza	Garza L-13, PHD L-13
		Glasscock	Howard-Glasscock L, M-8
		Hockley	LEVELLAND H-15, Slaughter H-14, Yellowhouse H-16
		Howard	Howard-Glasscock L, M-8, Morita L-9
		Mitchell	Sharon Ridge, 1700 M-10
		Pecos	Abell, Permian G-5, Taylor-Link I-3, Yates J-3
		Reagan	Big Lake K-4, Grayson K-4
		Scurry	Sharon Ridge, 1,700 M-10
		Terry	ALEX H-14
		Tom Green	Funk N-6
		Upton	McCamey I-4
		Winkler	Keystone Lime F-7, 8
		Yoakum	BRAHANEY F-13, Ownby G-13, Waples Platter G-13, Wasson F, G-12, 13, West F-13
	San Angelo	Gaines	Robertson G-10
		Howard	Iatan-East Howard M-9, Snyder M-9
		Irion	Irion N-4
		Scurry	Sharon Ridge 2,400 M-10
	Clear Fork	Andrews	Embar Permian G-8 (Tubb pay), Fullerton G-10, Union F-10
		Crane	CROSSETT 3,200 I-4, Sand Hills Tubb G-5, 6 (Tubb pay) Sand Hills, West G-6 ("Holt" pay)
		Gaines	Doss G-11, Russell F-12, Wasson (66) G-12, Wasson (72) G-12
		Glasscock	Howard-Glasscock L, M-8
		Hockley	Smyer I-15
		Howard	Howard-Glasscock L, M-8, Iatan East Howard M-9, Iatan North M-9, Snyder M-9, Vincent M-13
		Lamb	Anton I-16
		Lubbock	CRAVENS J-16, Lubbock K-15
		Mitchell	Iatan-East Howard M-9, Westbrook N-10
		Pecos	Abell, Permian G-5, McDer H-3, Masterson 3500 G-4, (Tubb pay)
		Reagan	Big Lake K-4
		Scurry	Sharon Ridge 2,400 M-10
		Ward	MONAHANS CLEAR FORK G-6, Monahans, Permian G-6 (Tubb Pay), Monahans, North F-7 (Tubb pay)
		Winkler	Keystone Holt F-7, 8 (Holt pay)
	Wichita	Andrews	MARTIN G-9
		Pecos	Abell, Permian G-5
	Wolfcamp	Pecos	MacDer H-3

TABLE I—(*continued*)

Age	*Formation*	*County*	*Field and Coordinate*
	Lower Undifferentiated	Upton	UPLAND K-5
Pennsylvanian	Cisco	Coke	Blackwell
	Strawn	Crockett Irion Kimble Midland Pecos Schleicher	Todd Deep L-3 TANKERSLEY N-4 Bolt MIDLAND J-8 WHITE & BAKER STRAWN I-3 Page P-3
	Bend	Concho	EDEN
Devonian		Andrews Crane Ector Gaines Winkler	BEDFORD-DEVONIAN F-9, DOLLAR HIDE F-8, FULLERTON 8,500 G-10, THREE BAR G-9 BLOCK 31-DEVONIAN H-5, Crossett I-4 TXL DEVONIAN G-7 JONES RANCH F-12 WHEELER-DEVONIAN G-7
Silurian		Upton Ward Winkler	McCamey I-4 Shipley Silurian G-5 KEYSTONE-SILURIAN F-8, WHEELER-SILURIAN G-7
Ordovician	Simpson	Andrews Crane Pecos	MARTIN 8,700 F-9 McKee G-5, Sand Hills Ordovician G-5, 6 Abell G-5
	Ellenburger	Andrews Crane Crockett Ector Pecos Reagan Ward Winkler	BEDFORD-ELLENBURGER F-9, Embar Ellenburger G-8, 9, FULLERTON ELLENBURGER G-10 BLOCK 31 ELLENBURGER H-5, Sand Hills Ellenburger G-5, 6 TODD DEEP L-3 TXL-ELLENBURGER G-7 Abell G-5, Apco-Warner G-4, Heiner G-4, Wentz H-3 Barnhart L-4, Big Lake K-4 Monahans Ellenburger G-6 Kermit Ellenburger F-7, 8; Keystone Ellenburger F-7, 8; Wheeler Ellenburger G-7
Cambrian		Pecos	Wentz H-3

two groups: the first and larger is the incidental exploration in drilling through the Permian to the pre-Permian, and the second is the generally shallow exploration carried on by independents on farm-out leases, and in some cases on privately owned acreage.

Ten new Permian pools were discovered in West Texas, three of which were found by wells which tested the pre-Permian formations. Reserves of several pools were considerably increased by extensions. Most of the Permian drilling was accounted for by the normal development of established pools. Development was especially active in such pools as Sand Hills (Tubb zone), Crane County; Fullerton (Clear Fork), Andrews County; Wasson (San Andres), Gaines and Yoakum counties; Slaughter (San Andres), Cochran and Hockley counties; and Garza (San Andres), Garza County.

TABLE II
FIELDS OF SOUTHEASTERN NEW MEXICO
(1945 discoveries in capitals)
(December 31, 1945)

Age	*Formation*	*Producing Formation*	*County*	*Field and Coordinate*
Permian	Delaware Mtn.		Eddy	Fenton B-10
	Tansill		Eddy	Hale B-10 (gas only), Scanlon B-10 (gas only)
	Yates		Eddy	Barber B-10, Benson B-11, Burton B-11, Empire A-11, Getty B-10, Lusk C-11, Lusk, West C-11, PCA B-10, Russell B-10, Shugart C-11, UNNAMED B-10 (gas only)
			Lea	Cooper-Jal E-8 & 9, Eaves E-8, Eunice, West D-10, Halfway C-10, Lea D-10, Lusk C-11, Lusk, East C-11, Lynch D-10, Lynch, North D-10, Rhodes E-8, Salt Lake C-10, San Simon E-10
	Seven Rivers		Eddy	Fren B-11 & 12
			Lea	Cooper-Jal E-8 & 9, Eaves E-8, Eunice, South E-10, Langlie-Mattix E & F-8 & 9, Tonto D-11, WATKINS C-11
	Queen		Chaves	Caprock C-13
			Eddy	Culwin B-11, Grayburg-Jackson B-12, High Lonesome B-12, Shugart C-11, Shugart, North C-11, Turkey Track B-11
			Lea	Caprock C-13, Corbin C-11, Eunice-Monument E-10 & 11, Langlie-Mattix E & F-8 & 9, Pearsall C-11, Penrose-Skelly E-9 & 10, YOUNG C-11
	Grayburg		Eddy	Anderson B-12, Artesia A & B-10, Dayton A-11, Dayton East A-11, Empire A-11, High Lonesome, South B-12, Leo B-11, Loco Hills B-11, Maljamar C-11 & 12, Premier B-11, Red Lake A-12, Robinson C-12, Square Lake B-12
			Lea	Arrowhead E-10, Eighty-Four Draw F-10, Eunice-Monument E-10 & 11, Hardy E-10, Maljamar C-11 & 12, Maljamar, North C-12, Maljamar, South C-11, Penrose-Skelly E-9 & 10, Roberts C-12, ROBERTS, WEST C-12, Robinson C-12, Vacuum D-11
	San Andres		Chaves	Comanche A-14
			Eddy	Atoka A-11, Daugherty A-12, Empire A-11, Grayburg-Jackson B-12, Henshaw B-12, Maljamar C-11 & 12, McMillan A-11, Robinson C12, Square Lake B-12, FORREST B-12
			Lea	Eunice-Monument E-10 & 11, Hobbs E-11, Lovington E-12, Lovington, West D-12, Maljamar C-11 & 12, Maljamar, South C-11, Robinson C-12, Skaggs E-10, Vacuum D-11
	Yeso	Paddock	Lea	HARRISON E-9, PADDOCK F-10
		Blinebry	Lea	BLINEBRY F-10
		Drinkard	Lea	Drinkard F-9, JONES F-10
Pennsylvanian	Pennsylvanian	Skaggs-Deep	Lea	Cass E-10
Ordovician	Ellenburger		Lea	BRUNSON E-10, Dublin E-8

IMPORTANT PERMIAN DEVELOPMENTS

YATES FORMATION

A small probably unimportant oil well in the Yates sand was completed in August by R. G. Patillo, Inc., Thornton Davis No. 1 (F-5), Sec. 105, Blk. 8 in H & GN Survey, Pecos County. The well flowed 70 barrels of 21.4° gravity oil and 1,130 barrels of sulphur water in 24 hours from 1,559–1,568 feet (total depth), The well is 3 miles from the nearest Yates production on the east, but was placed

TABLE III
WEST TEXAS OPERATIONS, 1940–1945

	1940	1941	1942	1943	1944	1945
Total wells drilled	1,866	2,325	1,320	902	1,672	1,744
No. of field producers	1,747	2,190	1,107	742	1,395	1,323
No. of exploratory wells	119	135	134	111	203	278
No. of exploratory producers	47	27	33	17	42	47
Per cent exploratory success	25.4	20.0	24.6	15.32	20.69	16.9
Pipe-line runs (millions of barrels)	112.91	117.57	81.03	98.07	160.78	175.54

TABLE IV
SOUTHEASTERN NEW MEXICO OPERATIONS 1940–1945

	1940	1941	1942	1943	1944	1945
Total wells drilled	542	371	339	260	405	393
No. of field producers	468	332	246	183	263	242
No. of exploratory wells	22	39	35	37	60	67
No. of exploratory producers	3	4	6	6	13	19
Per cent exploratory success	13.5	10.3	17.1	16.22	21.6	28.4
Pipe-line runs (millions of barrels)	35.48	39.34	31.93	38.47	39.03	36.87

in the Pecos Valley H. G. field for proration purposes by the Railroad Commission.

The Standard Oil Company of Texas abandoned the Baldwin No. 1, Sec. 26, Blk. 8, H & GN Survey, Pecos County, in January. The well was drilled to the total depth of 3,205 feet in Yates sand. The test was the last of three drilled in the vicinity in search of reef development on a flank terrace on the southwest edge of the Central Basin platform. The wells were drilled on a structure indicated by geophysical and subsurface information.

SAN ANDRES FORMATION

The San Andres formation has been one of the chief Permian objectives for exploratory drilling in the northern counties of the West Texas region. A large part of West Texas oil is produced from this formation. Five new oil pools were discovered in the San Andres in 1945.

H-14-Alex pool.—Fikes and Murchison's[6] Alexander No. 1, Sec. 18, Blk. K,

[6] Editors note.—Now Honolulu's Alexander No. 3.

PSL, Terry County, Texas, was completed, February 21, 1945, pumping 149 barrels of 32.1° gravity oil, plus 10 barrels of water in 24 hours after being treated with 3,000 gallons of acid. However, this potential test was not filed with the Railroad Commission during 1945. The well was drilled with cable tools from 5,127 to 5,153 feet, total depth. It was drilled on subsurface checked by seismograph information. The Texas Pacific Coal and Oil Company's N. M. Williams No. 1, Sec. 13, Blk. K, PSL, commenced drilling after the discovery well was unofficially completed, and was the first well to be officially completed. Four producing wells and two dry holes have been drilled on the structure to date.

G-13-Brahaney pool.—The Brahaney pool, located in west-central Yoakum County, was discovered by the Dunigan Bros. and Brahaney's W. S. Hodges No. 1, Sec. 446, Blk. D, J. H. Gibson Survey. The well was drilled to the total depth of 7,717 feet in lower Permian to test the three pay zones producing in the Wasson field on the south. The well was plugged back to 5,312 feet, and completed in the San Andres; its pumping potential was 76 barrels of 32° gravity oil after being treated with 14,500 gallons of acid. The top of the San Andres was found at 4,530 feet; "pay" is 5,250–5,272 feet. The well was originally drilled to total depth by the Skelly Oil Company on subsurface information, and was then sold to the Dunigan Bros. and Brahaney, who completed the well, June 24, 1945.

G-10-Fullerton San Andres pool.—San Andres production was discovered in May on the north edge of the Fullerton field in Andrews County by the Chalmette Petroleum Corporation's Lake Shore Corporation No. 1, Sec. 24, Blk. A-26, PSL. The well pumped 40 barrels of 35.2° gravity oil and 10 per cent water after a 4,000-gallon acid treatment from a pay zone topped at 4,580 feet. The Fullerton "pay" was found unproductive at the total depth of 7.637 feet, and the hole was plugged back to 4,785 feet.

F-14-Landon pool.—The Landon field of Cochran County lies 8½ miles from the west line and 1 mile from the south line of the county. The field was discovered by the Stanolind Oil and Gas Company's J. F. Edwards No. 1, Sec. 13, Blk. L, PSL. The well was drilled to the total depth of 5,111 feet, in San Andres, the top of which was found at 4,310 feet. A test at total depth recovered water, and the hole was plugged back to 5,080 feet. The well was completed in July, with a flowing potential of 387 barrels of 32.2° gravity oil and 9 barrels of water after a 2,500-gallon acid treatment. Top of "pay" is 5,040 feet. The well was located on a structure defined by geophysical and subsurface data.

H-15-Levelland pool.—The Levelland field was discovered in February by The Texas Company's G. P. Montgomery No. 1, Labor 19, League 70, Val Verde County School Land, in west-central Hockley County. The well was drilled to the total depth of 4,927 feet in the San Andres limestone, the top of which was found at 3,745 feet. Top of "pay" is 4,750 feet. The well was completed with a pumping potential of 95 barrels of 29° gravity oil and 9 barrels of water in 24 hours after a 15,000-gallon acid treatment. The discovery well was drilled on a structure located by subsurface and geophysical information.

CLEAR FORK DEVELOPMENTS

Three discoveries in the Clear Fork formation were plugged back after failing to produce from pre-Permian formations. Two were outpost failures to established pre-Permian pools and one was an Ellenburger (Ordovician) wildcat failure.

I-4-Crossett 3,200 pool.—The Texas Company's Hobbs No 3-B, north outpost to the Crossett (Devonian) pool of southeastern Crane County, was plugged back to 3,225 feet in Clear Fork (?) after being drilled to the total depth of 6,710 feet in Ellenburger dolomite. The well was completed in January with a flowing potential of 221 barrels of 42° gravity oil and 55 barrels of water in 24 hours through $\frac{22}{64}$-inch tubing choke from perforations at 3,190–3,210 feet after 4,000-gallon acid treatment.

G-6-Monahans Clear Fork pool.—Drilling of the Shell Oil Company's Sealy Smith Foundation No. 6, 6½ miles west of the northeast corner of Ward County and north outpost to the Monahans (Ellenburger) pool, was halted at 8,085 feet in Devonian chert, and the well was plugged back to 5,040 feet in strata probably Clear Fork in age, where it was completed in August with a flowing potential of 481 barrels of 37° gravity oil in 24 hours through ½-inch tubing choke after treating perforations at 4,730–4,840 with 6,500 gallons of acid.

Crane County.—The Gulf Oil Corporation's U. Henderson Estate No. I-E, Sec. 25, Blk. B-27, PSL, Crane County, was an Ellenburger (Ordovician) failure, which was completed as a San Andres producer. The well was drilled to 6,625 feet in Ellenburger dolomite, and was plugged back to 4,409 feet, where it was completed in June, in the Tubb zone with a potential of 840,000 cubic feet of gas and 5 barrels of water per day. The Gulf's Henderson No. 2-T, 3,150 feet north of the Henderson No. 1-E, and in same section, was completed in August with a potential of 654 barrels of 34.2° gravity oil per day, flowing through ¾-inch choke after 1,000-gallon acid treatment at 4,380–4,445 feet total depth, from the Tubb zone. This area has not been given a new pool name by the Railroad Commission.

PRE-CLEAR FORK DEVELOPMENTS

J-16-Cravens pool.—The Seaboard Oil Company of Delaware and Stanolind Oil and Gas Company's L. M. Cravens No. 1, Sec. 16, Blk. D., L & SV Survey, opened the Cravens pool, 11 miles north of Lubbock, Lubbock County, in February. The total depth drilled was 8,800 feet, in strata which are believed to be Pennsylvanian in age. The well was plugged back to 6,166 feet in Permian where it was completed with a pumping potential of 136 barrels of 24° gravity oil and 34 barrels of water in 24 hours after treatment with 10,000 gallons of acid. Top of "pay" is 6,050 feet. Top of Clear Fork was found at 4,940 feet. The structure was located on subsurface and geophysical information.

G-9-Martin pool.—The Martin pool, 8½ miles from the south line and 16½ miles from the west line of Andrews County, was discovered in March by the Sun Oil Company's N. C. Martin No. 1, Sec. 17, Blk. A-41, PSL. The well was drilled

to the total depth of 7,036 feet in the Permian, probably Wichita, where it was completed, with a flowing potential of 301 barrels of 36° gravity oil in 24 hours through $\frac{1}{4}$-inch tubing choke from open hole below 6,850 feet, after 6,000-gallon acid treatment. The location was made on the basis of subsurface and geophysical data.

K-5-Upland pool.—Discovery of the Upland pool, just northwest of the center of the east line of Upton County, is significant primarily because its location lies on the northward projection of the Reagan Arch trend. The pool was discovered in July by the Humble Oil Company's J. M. Parrott *et al.* No. 1, Sec. 3, EL & RR Survey. The well was drilled to 10,744 feet in chert, probably Devonian in age, and was plugged back to 9,943 feet in lower Permian (?). The well pumped 4.9 barrels of 42.3° gravity oil and 1.4 barrels water in 24 hours. Casing was perforated with 262 shots at 9,100–9,893 feet and later with 220 shots at 9,410–9,860 feet, with a few blank spaces. The well was treated through perforations with a total of 8,000 gallons of acid. The Humble drilled Grisham No. 1, one mile west to the total depth of 9,550 feet but lost hole and junked and abandoned it without testing. The prospect was located from geophysical data.

OTHER PERMIAN DEVELOPMENTS

The Shell Oil Company and The Texas Company's Ratliff and Bedford No. 1, Sec. 4, Blk. 73, PSL, Andrews County, discovery well for Devonian and Ellenburger production, found an excellent showing of oil in Wolfcamp, lower Permian. A 75-minute drill-stem test from 7,755 to 7,844 feet recovered 7,500 feet of 36° gravity oil and 300 feet of mud-cut salt water. Sweet gas appeared at the surface in 20 minutes and mud flowed in 50 minutes. Oil flowed into pits for 20 minutes after the hole had been open for 55 minutes. The total gas volume during the test was 885,000 cubic feet. The hole was deepened by coring and two additional tests were made to the depth of 7,880 feet. The last test recovered 4,900 feet of oil and 2,800 feet of salt water, with gas appearing at the surface in 20 minutes. The hole was then deepened to pre-Permian where the dual discoveries in Devonian and Ellenburger were made.

IMPORTANT POOL EXTENSION

Development of the Garza pool, 2 miles south of Post, was very active during 1945. The pool was extended to cover an area 3 miles long and 2 miles wide with outposts 2 miles northeast and one mile west of the center of the pool. Oil is produced from the San Andres, at an average depth of 2,800 to 2,900 feet. Initial production of the wells averages about 175 barrels of oil per day.

Developments in Pre-Permian of West Texas

Pre-Permian completions more than doubled the pre-Permian production and greatly increased the reserves of West Texas during 1945. Four Devonian, one Simpson, and two Ellenburger fields were discovered in Andrews County, the

most active area. The TXL-Devonian and Ellenburger pools in Ector County were the most active new-field discoveries in 1945. Drilling continued in the Keystone Ellenburger (10,000 feet) pool in Winkler County where 46 producers and 1 dry hole were completed in 1945. The Big Lake Oil Company's University No. 13-C, Sec. 25, Block 9, University Lands, Reagan County, drilled 1,644 feet of Ellenburger and basal sandstone before encountering pre-Cambrian granite.

DISCOVERIES

ANDREWS COUNTY

F-9-Bedford Devonian and Bedford Ellenburger pools.—The dual discovery and completion, Shell Oil Company, Inc., and The Texas Company's Ratliff and Bedford No. 1, Sec. 4, Block 73, PSL, was drilled to water in the Ellenburger, plugged back from 11,469 feet, total depth, and officially completed, November 1, 1945. The casing was perforated at 8,777–9,150 feet in the Devonian where it flowed 829 barrels of 42.9° gravity oil in 18 hours through $\frac{1}{2}$-inch casing choke on potential test after 1,000 gallons of mud acid. Pipe was perforated at 11,018–11,310 feet in Ellenburger topped at 11,018 feet, and the well flowed 1,214 barrels of 43.3° gravity oil per day through $\frac{1}{2}$-inch tubing choke on potential test after 500 gallons mud acid. Base of Permian is 8,110 feet and top of Devonian 8,780 feet. At the end of the year one well, Shell and Texas' Ratliff and Bedford No. 2, was drilling and one dry hole one mile southeast had been completed. The Sinclair Prairie Oil Company's Bedford No. 1, total depth 11,528 feet, tested dry in all formations and ran 373 feet low on the top of Ellenburger. The discovery well was drilled on a seismograph "high" after the subsurface structure of the Permian had been well established.

F-8-Dollar Hide pool.—Devonian production was discovered by the Magnolia Petroleum Company and Humble Oil and Refining Company's E. P. Cowden well No. 1 in Sec. 7, Block A-55, PSL. Total depth is 8,051 feet and the well flowed 244 barrels of 38.2° gravity oil per day through $\frac{3}{8}$-inch tubing choke on potential test, August 21, 1945, from perforations at 7,900–7,960 feet. Top of Devonian is 7,778 feet. This well is $\frac{5}{8}$ mile northeast of an 8,012-foot dry hole drilled a few years ago. Subsurface, seismograph and gravity information were used in locating the well.

G-10-Fullerton 8,500 pool.—The Stanolind Oil and Gas Company's University No. 1-P, Sec. 44, Block 13, University Lands, was completed, April 15, 1945, at depth of 8,855 feet, producing initially 439 barrels of 44° gravity oil per day flowing through $\frac{1}{4}$-inch tubing choke from perforations at 8,750–8,770 feet after being washed with 500 gallons mud acid. A drill-stem test at 8,828–8,844 feet, open 90 minutes, recovered 1,020-foot water blanket, 630 feet drilling mud, and 6,200 feet black sulphur water. Top of Devonian was 8,760 feet. Both subsurface and seismograph information were used in locating this well. One dry hole has been drilled between this well and the original Devonian production in the Fullerton field.

G-10-Fullerton Ellenburger pool.—The Fullerton Oil Company's H. N. Wilson

TABLE V
DISCOVERIES IN WEST TEXAS 1945

Map Co-Ord.	County	Pool	Operator	Farm	Location	Date	Producing Formation	Producing Interval (Feet)	Total Depth (Feet)	Initial Production	Discovery Method
F-9	Andrews	Bedford Devonian	Shell & Texas	Ratliff & Bedford 1	Sec. 4, Blk. 73 PSL	11-1	Devonian, Chert & Limestone	8,777– 9,150	11,469	F. 829 BO 18 H ½" CC	Seismograph & Subsurface
F-9	Andrews	Bedford Ellenburger	Shell & Texas	Ratliff & Bedford 1	Sec. 4, Blk. 73 PSL	11-1	Ellenburger Dolomite	11,018–11,310	11,469	F. 1214 BOPD ½" TC	Seismograph & Subsurface
F-8	Andrews	Dollar Hide	Magnolia & Humble	E. P. Cowden 1	Sec. 7, Blk. A-55 PSL	8-21	Devonian Chert	7,900– 7,960	8,051	F. 244 BOPD ¾" TC	Subsurface Seismograph & Gravity
G-10	Andrews	Fullerton San Andres	Chalmette Pet. Corp.	Lake Shore Corp. 1	Sec. 24, Blk. A-26 PSL	5-30	San Andres	4,550– 4,767	7,637	P. 40 BOPD+ 10% W.	Subsurface Trend
G-10	Andrews	Fullerton 8,500	Stanolind	University "P" 1	Sec. 44, Blk. 13 Univ.	4-15	Devonian Dolomite	8,750– 8,770	8,855 PB 8,789	F. 439 BOPD ½" TC	Subsurface & Seismograph
G-10	Andrews	Fullerton Ellenburger	Fullerton	H. M. Wilson "A" 322	Sec. 16, Blk. A-32 PSL	12-11	Ellenburger Dolomite	9,905– 9,945	9,945	F. 562 BOPD 12/64" TC	Subsurface
G-9	Andrews	Martin	Sun	N. C. Martin 1	Sec. 17, Blk. A-41 PSL	3-24	Wichita?	6,850– 7,036	7,036	F. 301 BOPD ½" TC	Subsurface & Geophysics
G-9	Andrews	Martin 8,700	Humble	J. E. Parker 1	Sec. 24, Blk. A-41 PSL	11-10	Simpson	8,700– 8,750	9,072	F. 578 BOPD ½" TC	Subsurface
G-9	Andrews	Three Bar	Stanolind	University D-1	Sec. 8, Blk. 11 Univ.	3-6	Devonian	8,300– 8,350	10,466 PB 8,385	F. 289 BOPD+4 BW ½" TC	Seismograph
F-14	Cochran	Landon	Stanolind	Edwards 1	Sec. 13, Blk. L, PSL	7-11	San Andres	5,025– 5,078	5,111 PB 5,080	F. 387 BOPD+9 BW	Geophysical & Subsurface
	Concho	Eden	Eltex	Martin 1	Sec. 6, GC&SFRR	10-9	"Bend"	3,803– 3,809	4,386	F. 81 BO 3 H	Surface & Subsurface
H-5	Crane	Blk. 31 Devonian	Atlantic	University A 31-1	Sec. 33, Blk. 31 Univ.	11-20	Devonian	8,812– 8,869	10,458	F. 193.77 BO 6 H ½" csg. ch.	Sesimograph & Subsurface
H-5	Crane	Blk. 31 Ellenburger	Atlantic	University A 31-1	Sec. 33, Blk. 31 Univ.	11-20	Ellenburger Dolomite	10,380–10,458	10,458	F. 275.9 BO 16 H ½" TC	Seismograph & Subsurface
I-4	Crane	Crossett 3,200	Texas	C. W. Hobbs "B"-3	Sec. 33, Blk. 35 H&TC	11-16	Clear Fork	3,190– 3,210	6,710 PB 3,225	F. 221 BO+ 55 BW 24 H 20/64" TC	Subsurface
L-3	Crockett	Todd Deep	Amerada	Todd 7-A	Sec. 25, Blk. WX GC&SF	2-27	Ellenburger	6,232– 6,318	6,350	F. 2,291 BOPD ¾" TC	Subsurface
G-8.	Ector	TXL Devonian	Shell & Cities Service	TXL 1	Sec. 7, Blk. 45, T-1-S, T&P	1-3	Devonian	7,886– 8,020	10,181 PB 8,050	F. 1,191 BOPD ½" TC	Subsurface & Seismograph
G-8	Ector	TXL Ellenburger	Shell	Thomas 1-A	Sec. 8, Blk. 45, T-1-S, T&P	5-15	Ellenburger	9,705– 9,852	9,852	F. 1,547 BOPD ½" TC Nat.	Subsurface & Seismograph
F-12	Gaines	Jones Ranch	Amerada	Jones Ranch 1-A	Sec. 3, Blk. A-6, PSL	11-13	Devonian	11,414–11,422	11,635 PB 11,288	F. 1,013 BO+ 371.74 BWPD ½" TC	Subsurface
H-15	Hockley	Levelland	Texas	Montgomery 1	Lab. 19, Lge. 70 Val Berde CSL	2-23	San Andres	4,750– 4,927	4,927	P. 95 BOPD+ 9 BW	Subsurface & Geophysical
O-4	Irion	Tankersley	Shell	Tankersley 2	Sec. 10, GC&SF	7-13	Strawn	7,195– 7,202	8,408 PB 7,264	F. 96.22 BO 24 H+5.63% W 8/64" ch.	Seismograph
J-16	Lubbock	Cravens	Seaboard & Stanolind	Cravens 1	Sec. 16, Blk. D, L&SVRR	2-28	Clear Fork	6,050– 6,166	8,800 PB 6,166	P. 136 BOPD+ 34 BW	Seismograph & Subsurface
J-8	Midland	Midland	Humble	Mrs. O. P. Buchanan 1	Sec. 32, W. M. Baldridge	11-6	Strawn	10,370–10,390	12,574 PB 10,455	F. 270 BO+32 BW 24 H 11/32" ch.	Seismograph
I-3	Pecos	White & Baker Strawn	Cardinal	White & Baker "C" 8	Sec. 44, Blk. Z TCRR	12-22	Strawn	7,580– 7,612	9,811 PB 7,979	F. 176 BOPD 11/32" TC	Work-over
H-14	Terry	Alex	Fikes & Murchison	Alexander 1	Sec. 18, Blk. K, PSL	2-21	San Andres	5,106– 5,153	5,153	P. 149 BO+10 BW 24 H Unofficial test.	Subsurface & Seismograph
K-5	Upton	Upland	Humble	Parrott 1	Sec. 3, EL&RR	7-7	Lower Permian	9,100– 9,893	10,744 PB 9,943	P. 4.9 BO+ 1.4 BWPD	Geophysical
G-6	Ward	Monahans Clear Fork	Shell	Sealy Smith 6	Sec. 37, Blk. A G&MMB&A	8-11	Clear Fork	4,730– 4,840	8,058 PB 5,040	F. 481 BOPD	Subsurface
F-8	Winkler	Keystone Silurian	Sun	Keystone 2	Sec. 4, Blk. 77, PSL	6-2	Silurian	8,460– 8,594	10,396 PB 8,594	P. 63 BOPD+ 47% W	Subsurface
G-7	Winkler	Wheeler Devonian	Sun	Wheeler 2	Sec. 13, Blk. B-7, PSL	4-2	Devonian	8,540– 8,590	10,610	F. 371 BOPD ½" TC	Subsurface
G-7	Winkler	Wheeler Silurian	Stanolind & Shell	Waddell Bros. & Co. 1	Sec. 8, Blk. B-7, PSL	12-5	Silurian	9,370– 9,390	10,813 PB 9,452	P. 141 BO+ 25 BWPD	Subsurface
G-13	Yoakum	Brahaney	Dunigan & Brahaney	Hodges 1	Sec. 446, Blk. D, J. H. Gibson Sur.	6-24	San Andres	5,250– 5,272	7,717 PB 5,312	P. 76 BOPD	Subsurface

TABLE VI

IMPORTANT EXPLORATORY WELLS COMPLETED, WEST TEXAS, 1945

Map Co-ord.	Name of Well	County	Location Sec.	Location Blk.	Location Sur.	Total Depth (Feet)	Oldest Formation Penetrated	Results	Date Completed	Remarks
H-10	Humble, Means 88-X	Andrews	9	A-35	PSL	14,093	Ellenburger	D&A	10-24	Deep test Means pool tested salt water in Ellenburger topped at 13,960
G-10	Magnolia, B. B. Ralph A-1	Andrews	12	A-37	PSL	10,991	Ellenburger	D&A	4-28	Deep test 1 mile west Fullerton. Base Permian 8,140. Top Ellenburger 10,671
G-9	Magnolia, Jos. Martin 1	Andrews	13	A-47	PSL	10,118	Devonian	D&A	6-21	Top Devonian 9,295
G-9	Magnolia, Stevens 1	Andrews	10	A-48	PSL	8,960	Devonian	D&A	9-17	Top Devonian 8,870 tested sulphur water
G-9	Mid Continent University 15-1	Andrews	42	13	UL	8,715	Devonian	F 1,427 BOPD	12-30	Devonian producer SW Fullerton pool, NW extension Stanolind I-P structure
F-17	El Paso Natural, West Tex. Mtge. & Loan 1	Bailey	55	A	MB&B	9,112	Pre-Cambrian	D&A	6-17	Top pre-Cambrian 9,105
G-14	Honolulu, Hudson 1-9	Cochran	9	P	PSL	5,154 PB 5,125	San Andres	P 111 BOPD & 5% W	1-25	Top San Andres 4,366. Top pay 5,120 3 miles SW Slaughter field
G-16	Stanolind, Elma L. Slaughter 1	Cochran	Lab. 49	Lge. 101	Jeff Davis CLS	10,840	Pre-Cambrian	D&A	6-17	Top Ellenburger 10,383, Top pre-Cambrian 10,839
G-15	Texas Gulf, Slaughter 1	Cochran		Lge. 113	Potter CLS	5,063	San Andres	F 141 BOPD	10-9	3 miles west extension Slaughter pool
G-14	Gulf, Henderson 1-E	Crane	25	B-27	PSL	6,625 PB 4,409	Ellenburger	840,000 gas & 5 BW	6-29	Sulphur water in Ellenburger topped at 6,580 PB to 4,409 completed in Clear Fork
H-5	John I. Moore et al. Southland Royalty 1	Crane	19	2	H&TC	8,012	Simpson	D&A	11-25	Base Permian 5,888 encountered Devonian, Silurian, Upper Ordovician & Simpson. Top Simpson 7,235
K-2	Gulf, University "O" 1	Crockett	12	29	UL	8,665	Ellenburger	D&A	12-11	Sulphur water in Ellenburger topped at 8,548
L-2	Richfield Archie Bean 1	Crockett	13	UV	GC&SF	8,806	Ellenburger	D&A	6-5	Top Simpson 7,818. Top Ellenburger 7,856
I-12	Magnolia, Cole 1	Dawson	48	M	EL&RR	4,896	San Andres	P 108 BOPD	4-14	2½ miles NW extension to Welch pool
I-12	Richmond, Nelson 1	Dawson	34	M	EL&RR	5,003 PB 4,923	San Andres	P 166 BOPD	1-9	3 miles N extension to Welch pool
N-15	Geo. P. Livermore, Bird 1	Dickens	288	1	H&GN	8,390	Pre-Cambrian	D&A	10-2	Top granite 8,388
G-10	Humble, Humble Fee Eubank B1	Gaines	6	AX	C. H. Eubank	10,255	Devonian	D&A	12-10	Base Permian 8,950, top Devonian 10,080
H-14	Gulf, Mallett 23	Hockley	2	X	PSL	7,536	Middle Permian	D&A	4-15	Deep dry hole S. end Slaughter field
H-15	Stanolind, Yellowhouse 1	Hockley	Lab. 2	Lge. 718	State CL	4,609	San Andres	P 62 BO & 70 BWPD	3-16	2½ miles NE extension to Yellowhouse pool
H-15	Texas & Pacific Rucker 1	Hockley	Lab. 15	Lge. 43	Rains CSL	7,850 PB 4,910	Clear Fork	488,000 cu. ft. Gas PD	3-10	Deep test, N extension to Slaughter field. Top San Andres 3,950. Sl gas well from Slaughter pay
L-9	Clardy, Fee 1	Howard	4	33-TIN	T&P	3,560 PB 3,151	San Andres	P 28BO & 14BW	12-30	Top San Andres 3,090, called Fairview by Railroad Com. but not commercial well and not shown on map
L-8	Continental, W. R. Settles D-1	Howard	133	29	W&NW	10,122	Ellenburger	Temp. Abnd.	7-3	Water in Ellenburger at 9,904

TABLE VI—(*continued*)

Map Co-ord.	Name of Well	County	Location Sec.	Location Blk.	Location Sur.	Total Depth (Feet)	Oldest Formation Penetrated	Results	Date Completed	Remarks
N-4	Skelly Calvin H. Sugg 1	Irion	45	1	H&TC	8,700	Ellenburger	D&A	9-11	Top detrital 7,920, top Ellenburger 7,932
L-15	Magnolia, L. D. Johnson 1	Lubbock	88	C	D&WC	10,178	Pre-Cambrian	D&A	2-21	Top Ellenburger 10,066, top granite 10,169
M-9	Magnolia Mary Foster 22	Mitchell	17	29	T&P	8,473 PB 3,140	Ellenburger	PB & Comp. in Foster (?) pay	1-10	Top Ellenburger 8,415 tested sulphur water
G-3	Gen. Crude & Tide Water Winfield 1	Pecos	2	132	T&STL	3,514	San Andres	D&A	8-21	Drilled in Permian high area south of Syncline south of Ft. Stockton High
G-3	Humble, Word 2	Pecos	601	Mrs. E. J. Carlton		8,228	Ellenburger	D&A	5-29	Top Ellenburger 7,650
H-4	McCandles, Atlantic 101	Pecos	101	11	H&GN	4,103 PB 3,099	Pre-Cambrian granite	5,900,000 cu. ft. gas PD	8-23	Top San Andres 2,970. Top Ellenburger 4,005
G-4	Pattillo, Davis 1	Pecos	105	8	H&GN	1,568	Yates	F 70 BO & 1130 BWPD	8-19	3 miles west of Pecos Valley, high gravity field
F-4	Phillips, Powe 1	Pecos	3	OW	TMRR	12,127	Pennsylvanian	D&A	8-14	Deep Test NW Ft. Stockton
	Stanolind, Presidio Trust 1	Presidio	99	3	D&P	5,005	Cretaceous	D&A	8-15	Western Presidio County
K-4	Superior Oil Co. University B 1-A	Reagan	12	1	Univ.	10,263	Ellenburger	D&A	1-30	Top Devonian 9,200, top Simpson 9,800, top Ellenburger 10,060
	G. E. Day Mary McBurnett 1	Schleicher	11	L	GH&SA	6,383	Ellenburger	D&A	7-28	Water in Ellenburger topped at 6,065
M-11	Lion, McLaughlin 1	Scurry	197	97	H&TC	3,724	Clear Fork	D&A	7-31	Encountered good shows of oil in structurally high well from San Andres topped at 1,655. San Angelo 2,415. Clear Fork 2,545
	Texas Co. Mrs. Willie Edwards 1	Tom Green	58	Dist 11	SPRR	5,955	Cambrian	D&A	6-20	Penetrated Ellenburger. Cambrian topped 5,905 tested sulphur water
	Texas Co., R. F. Garmon 1	Tom Green	85	11	SPRR	5,504	Ellenburger	D&A	2-13	10-11,000 gas per H top Ellenburger, 4,975 tested gas
I-4	DeKalb Agri. Ass'n., A. S. Burleson Est. 1	Upton	65	35	H&TC	8,586	Ellenburger	D&A	10-20	Sulphur water in Ellenburger topped at 8,440
G-6	Gulf, Edwards "B"-2-T	Ward	James M. Andrews Sur. #6 or 31	B19	PSL	6,439 PB 4,573	Clear Fork	P. 61 BOPD	2-27	Produced 834 barrels 36.4° gravity oil before plugging, abandoning
G-6	Gulf, John Edwards et al. 1	Ward	1	B19	PSL	10,862	Ellenburger	D&A	5-18	Top Ellenburger 10,530 tested sulphur water
F-5	Standard of Texas, Durgin "X" 1	Ward	15	34	H&TC	10,007	Pennsylvanian	D&A	6-11	Deep test west side South Ward pool
G-13	Honolulu, McLane 1	Yoakum	324	D	Gibson	8,016	Clear Fork	D&A	2-2	Deep test 4 miles N of Ownby field
F-13	Plymouth, Smith 1	Yoakum	567	D	Gibson	8,005	Clear Fork	Temp. Aband.	10-20	Deep test NE end of Wasson field. Show oil in Wasson pay

No. 322-A, Sec. 16, Block A-32, PSL, was completed, December 11, 1945, as the first Ellenburger producer in the Fullerton field. The well was drilled to the Ellenburger when it failed to develop Devonian production. Top of Ellenburger is 9,905 feet and total depth is 9,945 feet. Production is from open hole below $5\frac{1}{2}$-inch casing cemented at 9,867 feet. Initial production on potential test was 562 barrels of 40.6° gravity oil per day flowing through 12/64-inch choke on $2\frac{1}{2}$-inch tubing. This well was drilled in the western part of the Fullerton field near the top of the Permian structure and on the trend from Devonian production on the south, and its location was influenced by seismic surveys.

Five miles south, the Mid-Continent Petroleum Corporation's University No. 3-11 was being completed in the Ellenburger topped at 10,596 feet, with total depth of 10,696 feet. Drill-stem test at 10,650–10,696 feet, open 1 hour, recovered 1,440 feet water blanket and 2,416 feet of sulphur water. This makes the pay section about 54 feet thick.

G-9-Martin 8,700 pool.—The Humble Oil and Refining Company's J. E. Parker No. 1, Sec. 24, Block A-41, PSL, discovered oil in the middle Ordovician, Simpson, McKee sand. This is the first McKee sand production north of the Pecos River. On potential test taken, November 10, 1945, the well flowed 578 barrels of 42.3° gravity oil in 24 hours through $\frac{1}{2}$-inch tubing choke from perforation at 8,700–8,750 feet. This well tested sulphur water in the Ellenburger topped at 9,030 feet and was drilled to the depth of 9,072 feet. Base of Permian was 7,990 feet. The Devonian pay section was missing. This well was drilled on a trend play but near the Sun Oil Company's Martin No. 1 discovery well in the Permian.

G-9-Three Bar pool.—The Stanolind Oil and Gas Company's University No. 1-D, Sec. 8, Block A-41, PSL, was completed, March 6, 1945, at the depth of 10,466 feet in Ellenburger dolomite topped at 10,050 feet and plugged back to 8,385 feet in the Devonian. Initial production on potential test was 289 barrels 41° gravity oil per day plus 4 per cent water flowing through perforations at 8,300–8,350 feet, after being treated with 12,500 gallons of acid. This is a seismograph discovery. One dry hole was drilled one mile north. The Stanolind's University No. 1-BB diagonal southeast offset to the discovery well was structurally about 125 feet higher.

CONCHO COUNTY

Eden pool.—El Tex, Ltd., Martin No. 1, Sec. 6, Wm. Hughes Survey, Abs. 1,732, was completed, October 2, 1945, at the depth of 4,386 feet, plugged back to 3,938 feet. Top of "Bend" was 3,680 feet, top of Ellenburger 3,930 feet, and top of Wilberns sand 4,350 feet. On potential test, the well flowed 81 barrels of 44° gravity oil in 3 hours through $\frac{1}{2}$-inch tubing choke with gas-oil ratio of 1,353, tubing pressure 200 pounds, casing pressure 350 pounds. "Pay" is in the "Bend" through perforations at 3,808–3,809 feet. The test was made after 500 gallons of acid treatment. The east and southeast offsets were completed as dry holes after making small amounts of oil and water.

CRANE COUNTY

H-5-Block 31 Devonian and Block 31 Ellenburger pools.—The Atlantic Refining Company's University No. A-31-1 in Sec. 33, Block 31, University Lands, dual discovery and completion in the Devonian and Ellenburger, was completed, November 20, 1945. Total depth is 10,458 feet in Ellenburger dolomite topped at 10,291 feet. The well flowed on potential test, from Devonian topped at 7,890 feet and perforated at 8,812–8,869 feet, 772 barrels of 47.3° gravity oil in 24 hours through ½-inch casing choke. Ellenburger potential, after 250 gallons of acid, was 408 barrels of 47.2° gravity oil flowing through ½-inch tubing choke from open hole below 7-inch casing cemented at 10,380 feet. Scattered showings of oil were tested throughout the entire Devonian section of more than 1,000 feet. Twelve wells were drilling around the discovery on short-term leases at the end of the year. This was a seismograph discovery.

CROCKETT COUNTY

L-3-Todd Deep pool.—The Amerada Petroleum Corporation's Todd No. 7-A in Sec. 25, Block WX, GC & SF Survey, was completed on February 27, 1945, with top of Ellenburger at 6,068 feet and total depth of 6,350 feet. The Railroad Commission potential test was 2,291 barrels of 41.9° gravity oil flowing through ¾-inch tubing choke from perforations at 6,232–6,318 feet, after 1,000 gallons of acid. This well flowed 130 barrels oil in 7 hours through ¾-inch tubing choke from perforations at 5,786–5,910 feet in the "Crinoidal" limestone (Strawn). These perforations were squeezed off and the well completed as the first Ellenburger producer in the Todd Deep pool. Fifteen additional wells were completed as producers in the Ellenburger during 1945. This discovery should be credited to deeper drilling on a subsurface structure.

ECTOR COUNTY

G-8-TXL Devonian pool.—The discovery well was the Shell Oil Company and Cities Service Oil Company's TXL No. 1,[7] officially completed, January 3, 1945, flowing Devonian[8] oil, on the Railroad Commission potential test of 1,191 barrels of 41° gravity oil per day through ½-inch tubing choke from perforations at 7,886–8,020 feet, after 1,000 gallons of acid. Base of Permian and top of Devonian was 7,860 feet. The well tested sulphur water in the Ellenburger topped at 9,980 feet and drilled to 10,181 feet, total depth. The well was located on a combination of subsurface and seismic information. A total of 40 producers and two dry holes were drilled to the Devonian during the year and 29 wells were drilling in the field

[7] For additional information, see Sam C. Giesey and Henry G. Raish, "Developments in West Texas and Southwestern New Mexico," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 29, No. 6 (June, 1945), p. 749.

[8] Editor's note.—See Max David, "Devonian (?) Producing Zone, TXL Pool, Ector County, Texas," *ibid.*, Vol. 30, No. 1 (January, 1946), pp. 118–19.

at the end of the year. Proved production in the Devonian 4½ miles long and 1 mile wide was established during the year.

G-8-TXL Ellenburger pool.—The Shell Oil Company's Mrs. E. R. Thomas No. 1-A in Sec. 8, Block 45, T-1-S, T & P Survey, was completed, May 15, 1945, at total depth of 9,852 feet in Ellenburger topped at 9,695 feet. On potential test the well flowed 1,574 barrels of 44° gravity oil per day through ½-inch tubing choke from open hole below 5½-inch casing cemented at 9,705 feet. This well is ¾ mile north of the Devonian discovery well and enough higher structurally that the Devonian chert pay section was missing, as has been the case in most if not all of the Ellenburger producers. Eleven producers were completed in the Ellenburger during the year.

On the east side, near the south end of the pool, The Texas Company's Fraser No. 1-D in Sec. 27, Block 45, T-1-S, T & P Survey, was drilling on the east and downthrown side of a fault at the year's end. Top of Ellenburger was encountered at 10,740 feet or 1,162 feet lower than the Mid-Continent Petroleum Corporation's TXL No. 1, ⅞ mile northwest. This well will open a new pool, since the oil-water contact will be approximately 1,000 feet lower than that in the TXL field. The Sinclair Prairie Oil Company's Williamson No. 1 in Sec. 40, Block 45, T-1-N, T & P Survey, a 9,923-foot dry hole 2 miles north and slightly west of the TXL field, was too high for Devonian production and too low for Ellenburger production. Proved Ellenburger production was established in a belt 4 miles long and 1 mile wide.

GAINES COUNTY

F-12-Jones Ranch pool.—The Amerada Petroleum Corporation's Jones Ranch No. 1-A, in Sec. 3, Block A-6, PSL, was drilled to the depth of 11,635 feet in Devonian topped at 11,181 feet, plugged back to 11,422 feet, and completed, November 13, 1945. On the Railroad Commission potential test, the well flowed 1,013 barrels 43.5° gravity oil and 372 barrels of water per day through 1½-inch tubing choke from perforations at 11,414–11,422 feet. Previously the well had been treated with 4,000 gallons acid through perforations at 11,380–11,420 feet. Several production tests were made in the Devonian both above and below the producing zone. Lower Permian at 9,075–9,125 feet was tested and acidized by stages but showed only a small amount of oil cut with as much as 50 per cent water although it tested 5,320 feet of oil plus 3,584 feet oil and gas-cut mud in a one hour drill-stem test at 9,085–9,142 feet, while the well was drilling. One well was drilling in this pool at the end of the year.

IRION COUNTY

O-4-Tankersley pool.—The Shell Oil Company's Tankersley No. 2, Sec. 10, GC & SF Survey, in southeastern Irion County, was completed, July 13, 1945, as a Strawn producer after drilling to the depth of 8,408 feet in a sand of Cambrian age. Top of Strawn was at 7,195 feet, top of Ellenburger 7,280 feet, and top of

Cambrian sand 8,364 feet. The Railroad Commission potential was 96.22 barrels of oil plus 5.63 per cent water, flowing through 8/64-inch tubing choke from perforations at 7,195–7,200 feet after 500 gallons of acid. This is a seismograph discovery. One well was drilling.

MIDLAND COUNTY

J-8-Midland pool.—Midland County's first oil discovery was completed, November 6, 1945, when the Humble Oil and Refining Company's Mrs. O. P. Buchanan No. 1, Sec. 32, W. M. Baldridge Survey, flowed 270 barrels of 45.7° gravity oil plus 32 barrels of water through 11/32-inch tubing choke on potential test from perforations at 10,370–10,390 feet, after 4,500-gallon acid treatment in two stages. Top of Strawn was 10,290 feet, top of Devonian 11,395 feet, with Silurian, Upper Ordovician, Simpson, and Ellenburger present. Total depth is 12,574 feet in Ellenburger dolomite topped at 12,170 feet. This well may be more important from an historical standpoint than as a producer of oil. The Humble is drilling another test ¾ mile west of the discovery located on a seismograph structure.

PECOS COUNTY

I-3-White and Baker Strawn pool.—The Cardinal Oil Company's (Helmerich and Payne) White and Baker No. 8-C, Sec. 44, Block Z, TCRR Survey, was completed on December 22, 1945, with a potential of 176 barrels of 37.9° gravity oil flowing through 11/32-inch tubing choke from perforations at 7,580–7,628 feet in the Strawn. This well was originally completed as a dry hole in 1934 by the Humble Oil and Refining Company who drilled it to 9,811 feet in Ellenburger dolomite. The Cardinal went in the old hole and completed the well, with the initial production stated. However, they were continuing to test other zones at the year's end. This is the first Strawn production for Pecos County.

WINKLER COUNTY

F-8-Keystone Silurian pool.—The Keystone Ellenburger pool was discovered in 1943 but the first Silurian production was discovered in the Sun Oil Company's Keystone Cattle Company No. 2, Sec. 4, Block 77, PSL, which tested dry in the Ellenburger topped at 10,337 feet and drilled to the depth ot 10, 396 feet, was plugged back to 8,594, and completed, June 2, 1945, as a pumping well of 63 barrels of 31.4° gravity oil plus 47 per cent water per day from perforations at 8,460–8,594 feet, after acidizing. Several production tests at 8,350–8,600 feet were made before completion. The pay section is white porous limestone. All tests in the Silurian so far have been disappointing, and wells are completed in the Silurian only where the Ellenburger or other "pays" are incapable of making commercial wells. This well was drilled as an extension to the Keystone Ellenburger pool.

G-7-Wheeler Devonian pool.—The Wheeler Ellenburger pool was discovered in

TABLE VII

IMPORTANT DRILLING WELLS, WEST TEXAS

December 31, 1945

No. on Map	Map Co-Ord.	Name of Well	County	Location Sec.	Location Blk.	Location Sur.	Depth (Feet)	Remarks
1	H-5	Humble, Cowden 1	Crane	35	X	CCSD&RGNG	9,460 PB 6,285	Drilled through at least 3 major faults and shear zone below Devonian in Simpson & Ellenburger PB to test Devonian shows
2	J-3	Moore, Halff-Bivins 1	Crockett	65	1	I&GN	TD 7,512	Ellenburger test 3 miles SE. of Yates field. Top Simpson 6,730. Top Ellenburger 7,222. Testing
3	K-11	Seaboard, Lee 1	Dawson	47	34 T-5-N	T&P	TD 3,795	Wildcat SE. Dawson County testing show oil in San Andres. Top of San Andres 3,500
4	H-7	Cities Service, Parker 1	Ector	20	44 T-2-S	T&P	8,807	Deep test W. side Harper pool. Top Pennsylvanian 8,370
5	H-7	Stanolind, Kayser 1	Ector	34	43 T-2-S	T&P	8,247	Deep test W. side of South Cowden pool
6	G-8	Stanolind, Scharbauer 3-Q	Ector	12	A	PSL	9,155 PB 7,638	Deep test N. side of Goldsmith pool. Top Simpson 8,205. Top Ellenburger 8,926. Tested sulphur water in Ellenburger PB to test shows in Silurian and Permian
7	G-8	Stanolind, Williamson 1	Ector	5	45 T-1-N	T&P	9,004	Base Permian 7,975. Deep test W. of North Goldsmith pool
8	G-6	Texas, Connell 29	Ector	9	B-16	PSL	TD 9,675	Top Devonian 7,048. Top Simpson 8,440. Top Ellenburger 9,525. Testing
	G-7	Texas, Fraser 1-D	Ector	27	45 T-1-S	T&P	10,825	Drilled on down thrown side of fault. Top Ellenburger 10,740 or 1,162 feet low to nearest well. DST indicates commercial producer in Ellenburger
10	N-4	Moore, Murphey 1	Irion	1,227		GC&SF	TD 8,398	Testing
11	J-3	Gulf, White 1-E	Pecos	15	Z	TCRR	5,885	Deep test 3 miles W. of Yates pool
	F-2	Phillips, Elsinore 1	Pecos	53	D	GC&SF	10,655	Deep test in Sierra Madera uplift 20 miles S. of Fort Stockton
12	D-4	Argo, Roberts 1	Reeves	294	13	H&GN	8,298	Top Delaware 5,147. Top Leonard 7,840
13	E-5	Continental, Scott 1	Ward	33	33	H&TC	4,873	Top Delaware lime 4,812. Testing oil shows in Delaware sand topped at 4,835

1943 but the first well to be completed in the Devonian was the Sun Oil Company's R. A. Wheeler No. 1, Sec. 13, Block B-7, PSL, dually completed in Devonian and Ellenburger. This well was completed, April 2, 1945, although the potential of 371 barrels of 34.3° gravity oil per day flowing through ¼-inch tubing choke from perforations at 8,540–8,590 feet, after 2,000-gallon acid treatment, was taken on March 26, 1945. Top of Ellenburger is 10,560 feet and total depth 10,610 feet, plugged back to 10,601 feet. The well flowed 590 barrels of 44.2° gravity oil per day natural through ¼-inch tubing choke from perforations at 10,560–10,600 feet, on potential test. Two other wells were also dually completed in Devonian and Ellenburger before the end of the year.

G-7-Wheeler Silurian pool.—The Stanolind Oil and Gas Company and Shell Oil Company, Inc., completed Waddell Brothers and Company No. 1, Sec. 8, Block B-7, PSL, on December 5, 1945, as the first Silurian producer in the Wheeler pool, with a pumping potential of 141 barrels of 31° gravity oil and 25 barrels of water in 24 hours, after 9,000-gallon acid treatment. The 5½-inch casing was perforated at 9,270–9,390 feet. Top of Silurian is 9,170 feet. Top of Ellenburger, encountered at 10,736 feet, tested sulphur water in drilling to the depth of 10,813 feet and the well was plugged back to 9,452 feet.

Developments in Southeastern New Mexico

GENERAL

In 1945, there were 10 new discoveries in southeastern New Mexico, 9 oil and 1 gas. The most outstanding Permian discovery was the Paddock field, having production from dolomite about 30 feet below the top of the Glorieta sand, opening a new producing zone in southeastern New Mexico. The Brunson field, an important new Ellenburger field, was the only pre-Permian discovery. The 10 new discoveries were located primarily on subsurface geology with the exception of the Brunson in which a combination of subsurface and seismograph data was used.

The field names for New Mexico have been set up by the New Mexico Nomenclature Committee and approved by the Oil Conservation Commission of the State of New Mexico. The committee has attempted to give each pay zone a field name and as a result many names have been changed. The field names used in this paper were either proposed or in effect on February 28, 1946.

In Chaves County, on December 31, the Richfield Oil Corporation's Federal-Coll Co. 1, Sec. 18, T. 11 S., R. 27 E. (A-15), was reported to have stopped in dacite at 6,630 feet. A drill-stem test from 6,350 to 6,385 feet, open 2 hours, tested a maximum of 300,000 cubic feet of gas per day and recovered 1,440 feet of gas-cut salt water. Approximately 200 feet of Ellenburger dolomite was encountered above the reported dacite. Several wells of interest were drilling in the Drinkard and Brunson fields at the end of 1945.

TABLE VIII

New Discoveries in Southern New Mexico, 1945

Map Co-Ord.	Location Sec.	Location Twp.	Location Rge.	County	Field	Operator	Farm	Date	Producing Formation	Producing Interval (Feet)	Total Depth (Feet)	Initial Production	Discovery Method
B-10	21	20S	28E	Eddy	Unnamed	Nipper & Mc-Kinney	State 1	4-2	Yates	728– 740	933 PB 740	3,060,000 C. F. G.	Subsurface
B-12	34	16S	29E	Eddy	Forrest	Levers	Levers 1-B	12-30	San Andres	2,632–2,675	3,028 PB 2,675	F. 64 B/D	Subsurface
F-10	19	22S	38E	Lea	Blinebry	The Texas Co.	Blinebry 1	7-1	Yeso	5,580–5,625	7,517 PB 5,630	F. 159 B/D 15% W.	Subsurface
E-10	9	22S	37E	Lea	Brunson	Penrose	Penrose 1	9-14	Ellenburger	8,059–8,140	8,370 PB 8,159	F. 667 B/D	Subsurface and seismograph
E-9	16	23S	37E	Lea	Harrison	Amerada	State "PB" 1	12-5	Yeso	5,015–5,065	5,075	F. 155 BO 21 hrs. 77 B. W.	Subsurface
F-10	6	22S	38E	Lea	Jones	Penrose	Jones 1	11-26	Yeso	7,040–7,160	7,205 PB 7,165	F. 187 B/D	Subsurface
F-10	1	22S	37E	Lea	Paddock	Gulf	Paddock 1	4-7	*Yeso	5,200–5,230	5,843 PB 5,795	F. 610 B/D	Subsurface
C-12	2	17S	32E	Lea	West Roberts	Phillips	Lexco 1	5-24	Grayburg	4,150–4,298	4,298	F. 104 B/D	Subsurface
C-11	31	18S	32E	Lea	Watkins	Peckham	Watkins 1	12-29	Seven Rivers	3,566–3,606	4,180 PB 3,606	P. 16 B/D	Subsurface
C-11	20	18S	32E	Lea	Young	McCurdy	Young 1	2-14	Queen	3,765–3,778	3,783	F. 376 B/D	Subsurface

* R. E. King, "Stratigraphy and Oil-Producing Zones of the Pre-San Andres Formations of Southeastern New Mexico," *New Mexico Bur. Mines and Min. Resources Bull. 23*, p. 25

TABLE IX

Important Exploratory Wells Completed, Southeastern New Mexico, 1945

Map Co-Ord.	Name of Well	County	Location Sec.	Location Twp.	Location Rge.	Total Depth (Feet)	Oldest Formation Penetrated	Results	Date Com-pleted	Remarks
F-11	Stanolind, W. H. Jones 1	Lea	19	19S	39E	10,580	Pre-Cambrian	D&A	9-18	Pre-Cambrian test 3 miles SE. of Hobbs Field. Penetrated Permian, Devonian, Silurian, Upper Ordovician, and Simpson strata. Top Simpson, 9,995. 65 feet of Ellenburger possibly reworked encountered above pre-Cambrian
F-10	Humble, Federal-Keinath 1	Lea	8	21S	38E	9,954	Pre-Cambrian	D&A	2-20	Pre-Cambrian test 6 miles NE. of Eunice. Encountered Devonian in contact with Permian. Silurian, upper Ordovician, and Simpson are represented. Ellenburger topped at 9,680, tested water
C-12	Phillips, Lea-Mex. 4	Lea	17	17S	33E	13,998	Pennsylvanian	D&A	9-4	Deepest test drilled SE. New Mexico at E. end Maljamar field. Stopped in Pennsylvanian (Atoka "Bend") after entering Cisco (?) at about 11,640
F-12	The Texas Co., Eaves 1	Lea	26	16S	38E	10,085	Lower Permian	D&A	8-23	Deep test 12 miles N. of Hobbs. Stopped in lower Permian (Wolfcamp?)
D-13	Atlantic, J. E. Stevens 1	Lea	33	14S	33E	8,245	Abo	Temp. Aband.	2-22	Lower Permian test 15 miles NW. of Vacuum Field. Top of Glorieta 5,690. Top of Abo 7,765
F-10	Gulf, State-Andrews 1	Lea	32	22S	38E	7,400 PB 7,189	Yeso	F. 600 B/D	5-24	1½ miles SE. extension Drinkard-Yeso field. New producing zone 460 feet below production in Gulf Drinkard 1. Dolomite pay 6925–7000
E-9	Skelly, Steeler 1	Lea	17	23S	37E	7,200	Yeso	Temp. Aband.	5-27	Deep Permian test S. end of Skelly Penrose Field. Water in Paddock and Drinkard zones. Top Glorieta 5,070
	Stanolind, Picacho Unit 1	Lincoln	10	12S	18E	2,841	Pre-Cambrian(?) arkose	D&A	7-16	Stopped in arkosic material topped at 2,315

EXTENSIONS AND FIELD DEVELOPMENT

The greatest number of field wells were drilled in the Grayburg-Jackson and Square Lake fields of Eddy County, and the West Lovington field in Lea County. The Gulf Oil Corporation's Paddock No. 1, Sec. 1, T. 22 S., R. 37 E. (F-10), completed for 610 barrels of oil per day, stimulated drilling in the Paddock field and by the end of the year there were 17 producers.

The completion of the G. P. Livermore Incorporated and Malco's Ohio-State No. 1, Sec. 11, T. 13 S., R. 31 E., for 70 barrels, and the Livermore's Williams No. 1, Sec. 7, T. 13 S., R. 32 E., for 12 barrels of oil per day pumping, indicated extensions 1 mile southwest and 1 mile south of the Caprock field (C-13). Eight wells were completed in the field in 1945 bringing the total to 17 producers.

A 1½-mile southeast extension to the Drinkard field (F-9) of east-central Lea County was assured by the Gulf Oil Corporation's State-Andrews No. 1, Sec. 32, T. 22 S., R. 38 E. This well was drilled to 7,400 feet, plugged back to 7,189 feet, and completed in dolomite between 6,925 and 7,000 feet for 600 barrels of oil per day flowing. The production is from lower Yeso, 150 feet below the "pay" in the Gulf's Drinkard No. 1, the lower "pay" often referred to as the "State-Andrews." On September 30, 1945, DeKalb's Elliott No. 1, Sec. 6, T. 23 S., R. 38 E., 1½ miles southwest of Gulf's State-Andrews No. 1, was completed in the lower Drinkard "pay" for 567 barrels of oil per day flowing. Samedan's Boyd No. 1, Sec. 23, T. 22 S., R. 34 E., indicated over a 1-mile extension northwest of the Drinkard discovery well, when completed for 197 barrels of oil per day flowing from 6,370 to 6,440 feet. The Rowan Drilling Company's Elliott No. 1-B-15, Sec. 15, T. 22 S., R. 37 E., 1½-mile northwest extension to Samedan's Boyd No. 1, was completed in December, 1945, for 349 barrels of oil and 35 barrels of water per day flowing. It was drilled to 7,365 feet in pre-Cambrian and completed in the Drinkard "pay" (6,445–6,525 feet). These extensions have stimulated drilling activity in the area and at the close of 1945 there were 18 completed wells in the Drinkard field.

E-10.—An important southeast extension to the Cass field (formerly "Skaggs Deep") was assured when the Continental Oil Company's Skaggs No. 3-B, Sec. 23, T. 20 S., R. 37 E., was completed, with a natural flow of 1,938 barrels of oil per day from a limestone of Pennsylvanian age between 7,667 and 7,698 feet.

NEW DISCOVERIES IN SOUTHEASTERN NEW MEXICO

B-10.—Nipper and McKinney's State No. 1, Sec. 21, T. 16 S., R. 29 E., 2½ miles southwest of the Russell field in Eddy County, opened a new gas field in the Yates formation This well was drilled to 933 feet and plugged back to 740 feet. After shooting with 100 quarts of nitroglycerine from 665 to 740 feet, it was completed, April 2, 1945, for 3,060,000 cubic feet of gas per day. Two wells had been completed at the end of the year, and 1 well was drilling, Rutter's Ohio-State No. 1, ¾ mile east of the discovery. No official name has been assigned this gas field.

C-11-Watkins pool.—W. H. Peckham's Watkins No. 1, Sec. 3, T. 18 S., R. 32

E., discovered oil between 3,566 and 3,606 feet and was completed, December 29 1945, pumping 16 barrels per day through 2-inch tubing. The well was originally drilled by O. F. Featherstone to 3,500 feet and abandoned in February, 1944. Peckham resumed operations in April, 1945, and drilled to 4,180 feet in dolomite in the Queen formation before plugging back to 3,606 feet and completing in the Seven Rivers formation.

C-11-Young pool.—The E. J. McCurdy's Young No. 1 in Sec. 20, T. 18 S., R. 32 E., in west-central Lea County, was drilled to 3,783 feet and completed with a natural flow of 47 barrels of 38.5° gravity oil in 3 hours, through 2-inch tubing on February 14, 1945. The production is from the Queen formation between 3,765 and 3,783 feet. This well was first drilled by Ward and Barefield to 1,300 feet and temporarily abandoned. It was later taken over by McCurdy and re-completed in February, 1945. At the close of the year, McCurdy's Young No. 2, $\frac{1}{4}$ mile south of the discovery, was showing some free oil and the operators were preparing to shoot the well.

C-12-West Roberts pool.—The Phillips Petroleum Company's Lexco No. 1, Sec. 2, T. 17 S., R. 32 E., was given credit for the first well in the West Roberts field. It was completed in May, 1945, flowing 104 barrels of oil per day from the Grayburg formation between 4,150 and 4,298 feet. McLaughlin and Cosden's State No. 1, west offset to the Phillips' Lexco No. 1, pumped 76 barrels of oil in 9 hours at the depth of 4,057 feet in December, 1944. It was then drilled deeper and later plugged back, but no official potential test was taken until September, 1945. At the end of the year, 3 wells were completed and 3 were drilling.

B-12-Forrest pool.—On December 30, 1945, the Forrest E. Levers completed its Levers No. 1-B, in Sec. 34, T. 16 S., R. 29 E., 1 mile west of South High Lonesome field, with a flowing test of 64 barrels of oil per day. It was shot with 130 quarts of nitroglycerine from 2,630 to 2,675 feet. Oil is produced from the upper San Andres formation.

F-10-Paddock pool.—The most outstanding southeastern New Mexico discovery in the Permian in 1945 was the Gulf Oil Corporation's Paddock No. 1, Sec. 1, T. 22 S., R. 37 E., completed, April 7, 1945. This well is producing from a new dolomite "pay," the Paddock, 30 feet below the top of the Glorieta (topped at 5,170 feet). It was drilled to 5,843 feet, $5\frac{1}{2}$-inch casing was perforated with 180 shots from 5,200 to 5,230 feet, and acidized with 6,000 gallons with a 2-stage treatment. On initial potential test the well flowed 610 barrels of 38.4° gravity oil in 24 hours through 1-inch choke on 2-inch tubing. On the last day of December, 1945, there were 15 completed and 8 drilling wells in the Paddock field.

F-9-Harrison pool.—Nine miles southwest of the Paddock discovery, the Amerada Petroleum Corporation's State "PB" No. 1, Sec. 16, T. 23 S., R. 37 E., was completed, December 5, 1945, for 155 barrels of 39° gravity oil and 77 barrels of water flowing through 2-inch tubing on 20/64-inch choke in 21 hours. Oil is produced from the Paddock "pay" between 5,015 and 5,065 feet. The top of the Glorieta was encountered at 4,980 feet.

F-10-Blinebry pool.—The Texas Company's Blinebry No. 1, Sec. 19, T. 22 S., R. 38 E., will be remembered as the first well in southeastern New Mexico to encounter pre-Cambrian (7,435 feet) directly below the Permian. It was drilled to 7,517 feet, plugged back to 5,630 feet, and 7-inch casing was perforated from 5,580 to 5,625 feet with 212 shots. A total of 12,250 gallons of acid was used before taking the potential test. The well was completed July 1, 1945 for 159 barrels of 43° gravity oil per day flowing. This well is producing from a new dolomite "pay," the Blinebry, in the upper Yeso formation midway between the Glorieta and Drinkard sands.

F-10-Jones pool.—In November, 1945, Neville G. Penrose Incorporated completed its Jones No. 1, Sec. 6, T. 22 S., R. 38 E., located on the east side of the Paddock field, flowing 187 barrels of 39° gravity oil per day through 5/16-inch choke in 2-inch tubing. The casing was perforated with 480 shots from 7,040 to 7,165 feet and a total of 8,000 gallons of acid was used. The Drinkard sand was topped at 6,225 feet. Oil is produced from the lower Drinkard pay zone (State-Andrews) in the Yeso formation.

F-10-Brunson pool.—Neville G. Penrose Incorporated's Penrose No. 1, Sec 9, T. 22 S., R. 37 E., opened an important new Ellenburger field in New Mexico. It was the only pre-Permian discovery in southeastern New Mexico in 1945, and may represent an important reserve for the area. This well was drilled to 8,370 feet in pre-Cambrian, and found Simpson underlying the Permian at 7,190 feet. It penetrated 760 feet of Simpson before entering the Ellenburger at 7,950 feet (the lower Simpson being absent). It penetrated 252 feet of Ellenburger before entering pre-Cambrian. Casing was cemented at 8,224 feet, perforated from 8,059 to 8,140 feet with 280 shots, and acidized with 7,000 gallons. It was completed, September 14, 1945, flowing 667 barrels of 41° gravity oil per day. At the end of 1945 there were 5 drilling wells in the Brunson field.

Trends

Geophysical activity in the district averaged about the same during 1945 as in 1944. Core drilling was concentrated during the first part of the year.

During the past few years there has been a distinct relationship between the tax structure and exploratory and development drilling. This relationship may become even more marked in the months to come. When tax laws are favorable to exploratory and development drilling more wells will be drilled; when they are unfavorable fewer wells will be drilled.

The trend to electrical logging continues. When electrical logs are used in conjunction with sample descriptions they become very valuable, especially in defining and correlating sands that wash out of rotary samples.

Less reliance is being placed on drill-stem testing. Examples of drill-stem tests showing no fluid where later production tests prove good oil producers are too numerous to mention.

TABLE X

GEOPHYSICAL ACTIVITY, 1945
(Number of Crews)

Type	*In January*	*In July*	*In December*
	West Texas		
Seismograph	26	25	26
Gravimeter	11	7	7
Magnetometer	4	3	3
Core drill	10	2	0
Torsion balance	0	2	0
Electrical units	0	0	0
Total	51	39	36
	New Mexico		
Seismograph	7	4	4
Gravimeter	5	5	7
Magnetometer	2	5	5
Core drill	1	0	0
Torsion balance	2	1	2
Electrical units	0	0	0
Total	17	15	18

As drilling activity slackens more of the geologist's time can and will be given to research work.

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BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6 (JUNE, 1946), PP. 958-962, 1 FIG.

DEVELOPMENTS IN ARIZONA, WESTERN NEW MEXICO, AND NORTHERN NEW MEXICO IN 1945[1]

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ABSTRACT

The drilling of three dry holes in the southern half of Arizona constituted the year's activities for that state. Sixteen wildcats, all unsuccessful, were completed in northern New Mexico. Eight of these were in the San Juan basin, 6 in the north-central part of the state, and 2 in the northeastern part. Tests to the pre-Cambrian on the southern flank of the San Juan basin and in southern Santa Fe County furnished geological information of particular value.

Six outposts were completed in the producing area of the San Juan basin, of which 3 were dry, 2 were completed as extension wells, and one as a new-pool discovery. The three producers are gas wells. A discovery of some importance was made by a deep test on the Barker dome in northern San Juan County, which encountered a large volume of gas in Pennsylvanian strata between 8,419 and 8,630 feet.

There was considerable geological and geophysical activity throughout the year, especially in northwestern New Mexico.

INTRODUCTION

The district here considered includes Arizona and all of New Mexico except the southeastern part (Fig. 1). Twelve fields, all located in the San Juan basin, produced approximately 458,000 barrels of oil and $5\frac{1}{4}$ million cubic feet of gas in 1945; and two small fields in northeastern New Mexico produced carbon-dioxide gas.

A total of 19 new-field wildcats were drilled in the district in 1945, of which 3 were in southern Arizona, 8 in the San Juan basin, 6 in north-central New Mexico, and 2 in northeastern New Mexico. Six outposts were completed in the producing area of the San Juan basin, of which 3 were dry, 2 were completed as extension wells, and one as a new-pool discovery. A deeper-pool test in northern San Juan County was successful.

DISCOVERIES

The single discovery of importance was made on the Barker dome, just south of the Colorado-New Mexico state line, by the Southern Union Production Company. This company has the entire structure under lease and since 1942 has been securing gas from the Dakota sandstone at an average depth of 2,700 feet. In mid-1944 the company started a deep test, the Southern Union's Barker No. 9, in Sec. 21, T. 32 N., R. 14 W., which by March, 1945, had reached the total depth of 9,466 feet, where quartzite, presumably Cambrian in age, was encountered. Operators plugged back to 8,700 feet, perforated 7-inch casing at 8,419–8,490 feet and 8,620–8,630 feet, and secured a flow of 42,000,000 cubic feet

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[2] Oil and Gas Division, New Mexico Bureau of Mines and Mineral Resources. A part of the information in this paper was provided by John A. Frost, United States Geological Survey, Artesia, New Mexico.

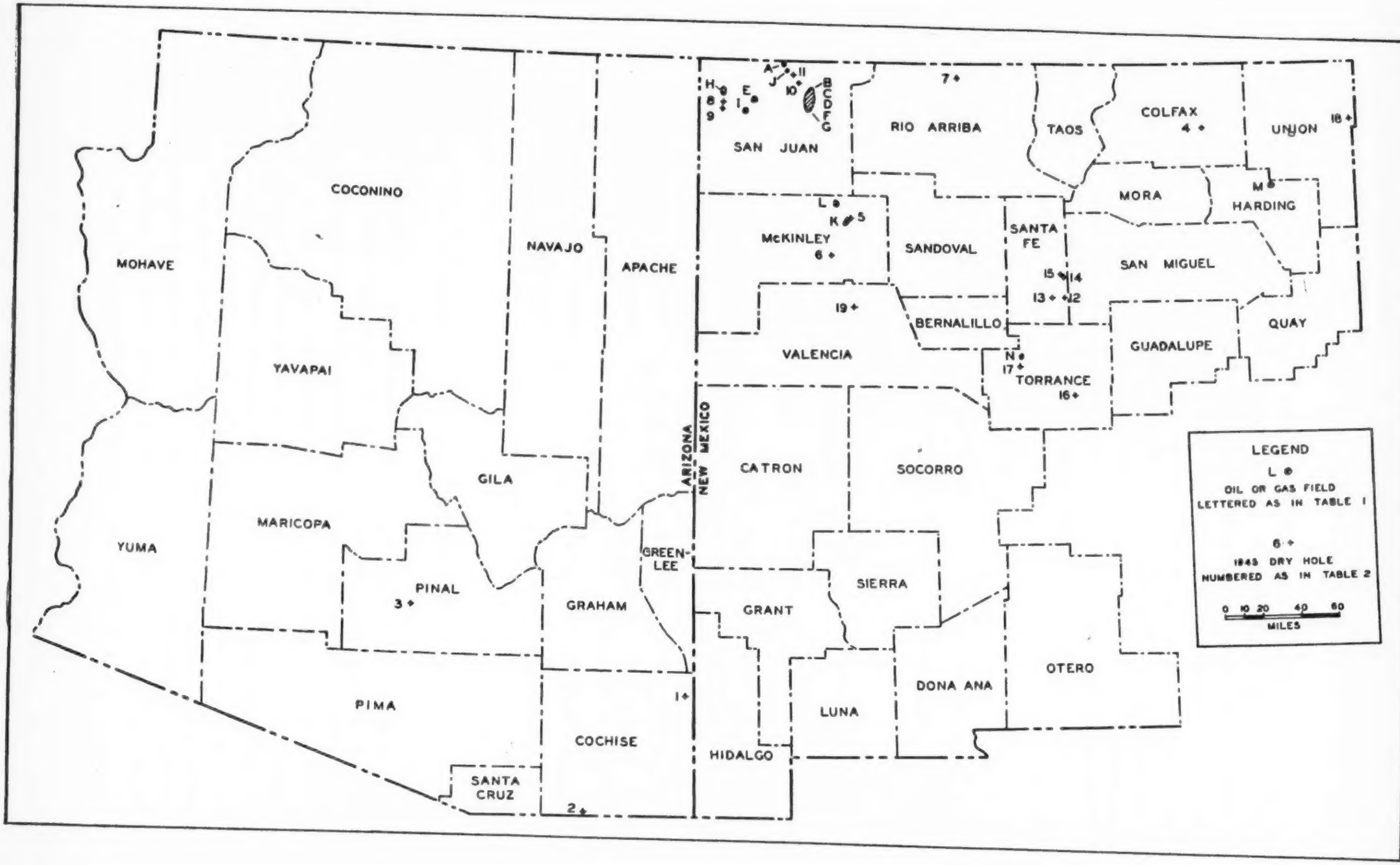
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
GILA
MARICOPA
YUMA
PINAL
GRAHAM
GREEN-LEE
PIMA
COCHISE
SANTA CRUZ
ARIZONA
NEW MEXICO
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
MORA
HARDING
McKINLEY
SANDOVAL
SANTA FE
SAN MIGUEL
BERNALILLO
QUAY
GUADALUPE
VALENCIA
TORRANCE
CATRON
SOCORRO
SIERRA
GRANT
LUNA
DONA ANA
OTERO
HIDALGO
LEGEND
OIL OR GAS FIELD
LETTERED AS IN TABLE 1
1943 DRY HOLE
NUMBERED AS IN TABLE 2
0 10 20 40 60
MILES

FIG. 1

of gas per day at a bottom-hole pressure of 2,975 pounds per square inch. A second deep well, the Barker No. 11, was completed in Sec. 16, T. 32 N., R. 14 W., one mile north of the discovery, producing initially 27,000,000 cubic feet of gas per day through perforations in 7-inch casing at 8,855–8,875 feet. The gas from both these wells, which is dry and sour, reportedly comes from the Pennsylvanian Paradox formation. The wells remain shut in, pending construction of a plant to treat the gas. A third deep test, one mile south of the discovery well, was drilling at the end of the year.

The Southern Union's Barker Nos. 9 and 11 were drilled on geological evi-

TABLE I

OIL AND GAS FIELDS IN NORTHERN NEW MEXICO

Key Letter*	Field Name	Producing Formation	Age	Gas or Oil
		SAN JUAN COUNTY		
A	Barker	Dakota	Cretaceous	Gas
A	Barker (deep)	Paradox	Pennsylvanian	Gas
B	Blanco	Mesaverde, Pictured Cliffs	Cretaceous	Gas
C	Bloomfield	Farmington	Cretaceous	Gas, oil
D	Fulcher Basin	Pictured Cliffs	Cretaceous	Gas
E	Hogback	Dakota	Cretaceous	Oil
F	Kutz Canyon	Pictured Cliffs	Cretaceous	Gas
G	Oswell	Farmington	Cretaceous	Gas, oil
H	Rattlesnake	Dakota	Cretaceous	Gas
H	Rattlesnake (deep)	Ouray-Leadville	Devonian-Mississippian	Helium gas
I	Table Mesa	Dakota	Cretaceous	Oil
J	Ute	Dakota	Cretaceous	Gas
		MCKINLEY COUNTY		
K	Hospah	Hospah	Cretaceous	Oil
L	Red Mountain	Mesaverde	Cretaceous	Oil
		HARDING COUNTY		
M	Bueyeros	Dockum	Triassic	CO_2 gas
		TORRANCE COUNTY		
N	Estancia	Sandia	Pennsylvanian	CO_2 gas

* See Figure 1.

dence, both specific as to the Barker dome and general as to the possibilities of commercial accumulations in the Paleozoic limestones of the region. The fact that both discovery well and outpost were successful, the volumes of gas produced, and the distance between the wells, indicate a gas field of some magnitude, in a new productive zone for gas in the San Juan basin.

The Fulcher Basin field was extended $\frac{3}{4}$ mile northwest by the M.S.B.W.'s Hargis No. 1, in Sec. 33, T. 30 N., R. 12 W., producing 1,200,000 cubic feet of gas per day from the Pictured Cliffs sandstone at 1,808 feet. The Southern Union's Cain No. 1, in Sec. 15, T. 28 N., R. 10 W., was drilled as a $2\frac{1}{2}$-mile east outpost to the Kutz Canyon field, which produces gas from the Pictured Cliffs sandstone at about 1,950 feet. A flow of 1,800,000 cubic feet of gas per day was encountered in the Farmington sandstone at 1,350–1,398 feet, with a bottom-hole pressure of 455 pounds per square inch, and consequently the well was completed as a

Farmington producer. It thus ranks as a minor new-pool discovery. Both the foregoing wells were drilled simply as outposts, without surface geological evidence and presumably without much subsurface evidence, in an area of stratigraphic accumulations of gas in lenticular Cretaceous sandstones.

WILDCAT DRILLING

No logs are available for the three dry holes completed in southeastern Arizona and thus it is impossible to assess their geological value. All were drilled by independent operators on non-technical evidence.

The Plymouth Oil Company's Santa Fe 1-A (Table II), on the south flank of the San Juan basin, is of considerable interest because it encountered only 200–300 feet of Pennsylvanian limestone overlying the pre-Cambrian. An 1,800-foot section of Pennsylvanian and older limestones has been penetrated by deep tests in the Rattlesnake field in the northern part of the basin, and it is considered likely that a thicker section exists in the central part; the marked thinning of these Paleozoic limestones toward the south, against the pre-Cambrian rocks of the Zuni landmass, is demonstrated by the Plymouth test.

TABLE II

WILDCATS COMPLETED IN ARIZONA AND NORTHERN NEW MEXICO IN 1945

*Key Number**	*County*	*Well*	*Location*	*Total Depth (Feet)*	*Formation at Total Depth*	*Date*	*Remarks*
			Arizona				
1	Cochise	M.K.D. Fitzwater-Fee 1	5-14S-31E	1,595	Volcanics	Aug.	
2		Ari-Tex Oil Co.-Goins 1	4-24S-23E	1,005	Volcanics	5/5	
3	Pinal	Casa Grande-Laveen 1	25-6S-7E	4,590	Pre-Cambrian	5/15	
			Northern New Mexico				
4	Colfax	Texwell-Sauble 1	35-27N-24E	2,520	Pre-Cambrian	3/22	Reportedly drilled for CO_2
5	McKinley	Freelove-Santa Fe 1	29-18N-8W	2,900	?	4/28	
6		Plymouth-Santa Fe 1-A	13-15N-10W	6,210	Pre-Cambrian	10/7	On Walker dome; south flank of San Juan basin
7	Rio Arriba	Rhoades-Sargent 2	23-31N-3E	816	Morrison	12/16	Dakota test in Chama basin
8	San Juan	Continental-Navajo 1	14-28N-19W	1,510	Morrison	Aug.	Dakota test; 5 miles south of Rattlesnake field
9		Continental-Navajo 2	36-29N-19W	1,482	Morrison	Oct.	Dakota test; 3 miles south of Rattlesnake field
10		Southern Union-Thompson 1	33-31N-12W	2,368	Pictured Cliffs	9/27	Pictured Cliffs gas test
11		Stiles-Gaberhart 1	15-31N-13W	820	Fruitland	Aug.	Farmington gas test
12	Santa Fe	Adkins-Fee 1	23-12N-11E	977	Pre-Cambrian	Sept.	Pennsylvanian test
13		English-Fullerton 1	16-12N-10E	3,210	Pre-Cambrian	7/29	Pennsylvanian test
14		Richfield-Lee 1	25-14N-11E	2,600	Pre-Cambrian	Sept.	Pennsylvanian test on Cow Springs anticline, Glorieta Mesa
15		Richfield-Lee 2	14-14N-11E	2,710	Pre-Cambrian	Oct.	Flank test on Cow Springs anticline
16	Torrance	Stewart-Lammons 1	3-3N-12E	678	Pre-Cambrian	Aug.	In Pedernal Hills
17		Witt-Meadows 1	23-6N-7E	2,123	Pre-Cambrian	5/17	Pennsylvanian CO_2 test
18	Union	Herndon-Mock 1	25-27N-36E	4,555	Sangre de Cristo	3/3	Much arkose below 3,000 feet
19	Valencia	Cornell-State 1	36-11N-8W	1,167	Morrison	2/12	Dakota test on anticline south of Mount Taylor

* See Figure 1.

Two of the four unsuccessful wildcats in Santa Fe County were located on combined geological and geophysical evidence. All tested the Pennsylvanian strata, which were found to vary greatly in thickness and character. Appreciable oil staining is reported from two of the tests.

The four unsuccessful Dakota tests drilled in or on the fringes of the San Juan basin, all located on surface structures, emphasize the disappointing results to be expected from the Dakota in northwestern New Mexico.

TABLE III
DRY OUTPOSTS COMPLETED IN SAN JUAN COUNTY IN 1945

Well	*Location*	*Total Depth (Feet)*	*Formation at Total Depth*	*Date*	*Remarks*
Kutz deep test-Davidson 1	28-28N-10W	5,710	Mancos	July	1 mile southeast of Kutz Canyon field
Southern Union-Cain 2	15-28N-10W	2,190	Lewis	Sept.	Pictured Cliffs test 1 mile north of Cain No. 1
Southern Union-Rice 1	20-30N-12W	2,015	Lewis	Oct.	Pictured Cliffs test 2 miles northwest of Fulcher Basin field

TRENDS IN EXPLORATORY METHODS

Nine-tenths of the district here considered is non-productive of oil or gas, and is known to be geologically complex. Although a few operators still locate wildcats without technical advice, in recent years most operators have acquired competent geological and geophysical evidence before drilling. Several major companies, in fact, have gone to considerable expense to secure excellent regional geological reports, presumably preliminary to detailed studies of individual structures. All but one or two of the wildcats completed in New Mexico in 1945 were drilled on geological evidence, and of these at least two were located on geophysical evidence as well.

Throughout the year, and continuing into 1946, extensive geophysical exploration was carried on in the San Juan basin, by both major companies and independents. Seismograph, magnetometer, and torsion-balance surveys were all being made, attention being increasingly focused on the oil and gas possibilities of the Paleozoic limestones at great depths. How much leasing has taken place is unknown, but there is little doubt that the San Juan basin is on the verge of an intensive leasing and drilling campaign.

At least one major company had a geological party at work mapping surface structure in northeastern Arizona in 1945.

STRATIGRAPHY

Numerous stratigraphic matters were under vigorous discussion in the district, of which the most important is the problem of origin, thickness, character and relations of the Paleozoic limestones—the Pennsylvanian in northeastern New Mexico and the Pennsylvanian and earlier Paleozoics in northwestern New Mexico and Arizona. A 1945 publication of use and interest on these subjects is *Preliminary Chart 10* of the United States Geological Survey series of oil and gas investigations, "Late Paleozoic Stratigraphy of Central and Northeastern Arizona," by Huddle and Dobrovolny.

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DEVELOPMENTS IN NORTH AND WEST-CENTRAL TEXAS IN 1945[1]

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ABSTRACT

In 1945, the north and west-central Texas areas contributed 125 discoveries, including successful wildcats, extensions of proved areas, outposts, and deepenings in proved areas. This is comparable with 104 discoveries in 1944.

Twenty-two hundred and forty tests were drilled in 1945, resulting in 1,227 productive wells and 1,013 failures, representing an increase of 28 per cent in drilling activity.

Total oil production in 1945 was approximately 54,283,064 barrels compared with 54,100,000 in 1944, or an increase of 183,064 barrels. Wichita County was the leading producer with 12,179,440 barrels.

The most important developments were (1) Sivell's Bend area in northern Cooke County, in the southeast extension of the Marietta Basin province, where numerous Strawn sandstones were found productive, (2) central Montague County, in the Fort Worth Basin province, where prolific Bend conglomerates indicate a major northwest extension of the Hildreth field, and (3) Harrold area, Wilbarger County, in the Electra Arch province, where Canyon, Strawn, and Ellenburger limestones are productive in the National pool.

The Ellenburger formation was accountable for 10 discoveries in 1945, suggesting that its importance as a producing formation may be on the upgrade. No estimate of its known reserves, however, can be made at this time. Cisco sandstones also continued in prominence. Mississippian limestone definitely declined in prominence.

The most successful methods of exploration continued to be subsurface and seismograph. Many of the shallow discoveries were the result of mapping on shallow markers, and shallow exploration will in all probability continue to play an important role in future exploration.

INTRODUCTION

The area of the north and west-central Texas districts extends from the Red River on the north to the Llano uplift on the south, and from the Fort Worth basin on the east to the east flank of the Midland basin on the west. The principal uplifts include the Muenster arch, the Electra or Wilbarger arch, and the Bend arch. The principal basins are Fort Worth basin, Palo Duro basin, and Baylor basin. The Muenster arch, a southeast-trending extension of the Wichita-Amarillo uplift, separates the Marietta basin on the northeast from the Fort Worth basin on the southwest. The Electra arch, a west-trending feature, separates the Palo Duro basin on the north from the Baylor basin, a northeastern phase of the Midland basin. The Bend flexure, a north-trending feature emanating from the Llano uplift, separates the Baylor basin on the west from the Fort Worth basin on the east. Although the foregoing are current expressions of structural provinces, it must not be assumed that their geologic history is necessarily similar.

DEVELOPMENT

Development in north and west-central Texas in 1945 showed an increase in explorational activities over 1944 in the amount of geophysical exploration as

[1] Manuscript received, March 15, 1946. Presented by title before the Association at Chicago, April 2–4, 1946.

[2] Data for this article received from T. F. Petty, Humble Oil and Refining Company, Wichita Falls; W. L. Haseltine, Magnolia Petroleum Company, Wichita Falls; W. G. Sinclair, Gulf Oil Corporation, Wichita Falls; and J. E. Owens, Shell Oil Company, Inc., Wichita Falls; compiled and edited by H. L. Rickard, Shell Oil Company, Inc., Box 2010, Wichita Falls.

well as wildcat drilling. Routine drilling also continued on the upgrade; however, the percentage of successes and the amount of oil produced was on a par with 1944. Twenty-two hundred and forty wells were drilled in the two districts, compared with 1750 the previous year. Of these, 1,227 were producers while 1,013 were dry, as compared with 868 producers and 882 failures in 1944. The total number of wells drilled includes 468 wildcats which resulted in 68 successful completions and 400 failures.

Total production of north and west-central Texas in 1945 was 54,283,064 barrels, or an increase of only 183,064 barrels over 1944. As usual, Wichita County led in the amount of oil produced, but that county's production continued to decline, with a decrease of 1,243,152 barrels under 1944, due in a large measure to the continued decrease in recovery from the K.M.A. Strawn sand pool.

The new fields, outposts, extensions, and successful deepenings are tabulated in Table I, and their location is indicated in Figure 1. A brief discussion of the more important discoveries and developments follows; however, no attempt is made to evaluate them in order, due to the fact that subsequent development might alter their position in importance.

1. One of the more important discoveries and developments is the Sivell's Bend area in northern Cooke County, in the southeast extension of the Marietta Basin province. The discovery well, The Texas Company's Rasure No. 1, was completed and recorded in late 1944; however, nine additional wells have been completed from six different Strawn sandstones ranging in depth from 6,200 to 7,500 feet, and this development has probably proved an area of approximately 4,000 acres. The productive sandstones appear to be correlative with those that produce in the prolific Walnut Bend field approximately 9 miles southeastward.

2. A rapid development of the Wilson field was evident, where shallow Strawn sandstones are productive on the east flank of the Muenster arch in eastern Cooke County. To date, approximately 25 wells have been completed with several additional operations drilling. The Wilson field has been defined on the southeast and west.

3. A very prolific shallow Cisco sandstone was found on the crest of the Muenster arch in Cooke County, and 30 wells had been successfully completed at the end of 1945. Named the Gatewood pool, it has been defined only northward and an extensive productive area is anticipated.

4. On the west flank of the Bowers structure, which occupies a crestal position on the Muenster arch in northeastern Montague County, Nu-Enamel's Langford No. 1 produced from a granite wash zone. The producing zone is not present in the Bowers field, and constitutes a stratigraphic trap by updip pinch-out. Three producers and two failures were drilled as a result of this discovery, and two more are drilling.

5. Bend conglomerates consisting of granite wash material continue to be important oil reservoirs in western Montague County. Several discoveries in this

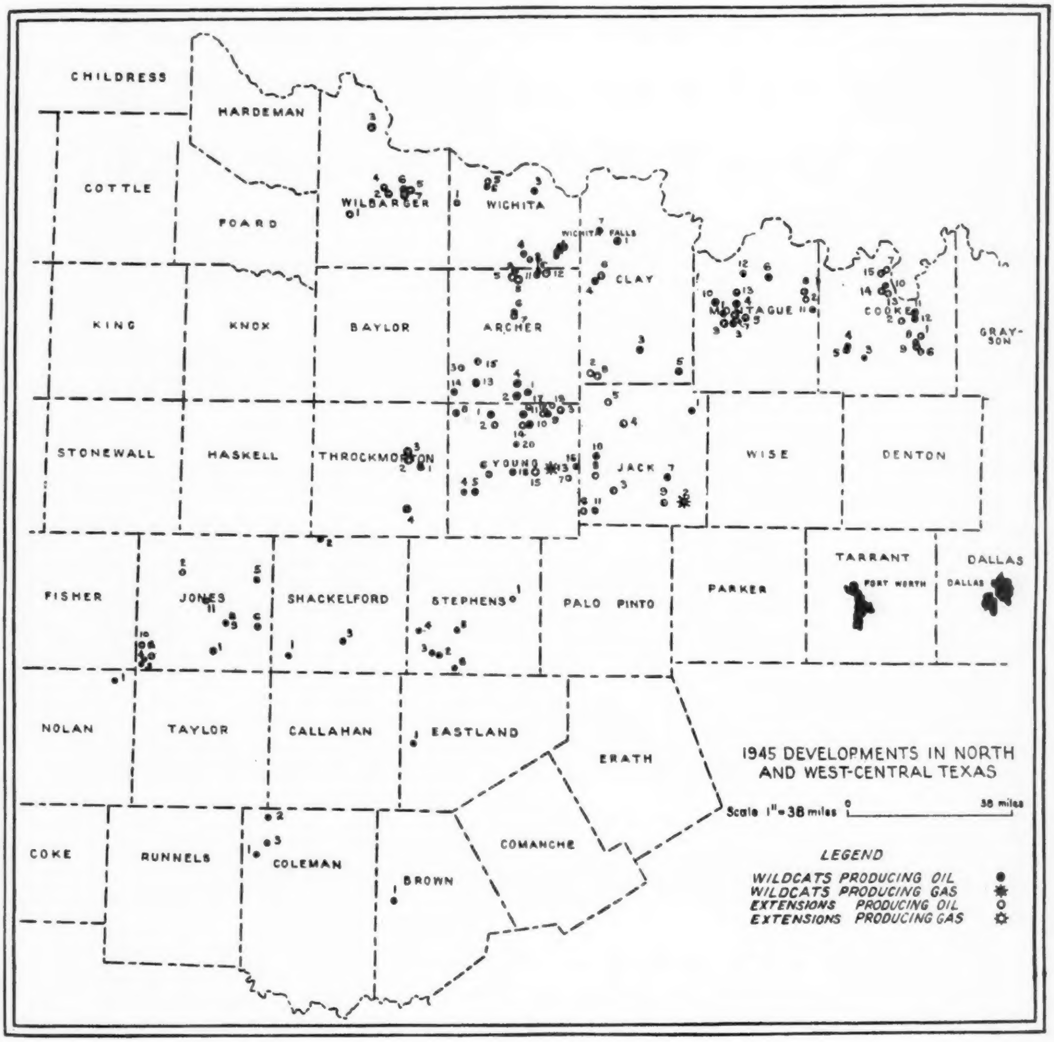

CHILDRESS
HARDEMAN
COTTLE
FOARD
WILBARGER
WICHITA
WICHITA FALLS
CLAY
MONTAGUE
COOKE
GRAY-SON
KING
KNOX
BAYLOR
ARCHER
STONEWALL
HASKELL
THROCKMORTON
YOUNG
JACK
WISE
DENTON
FISHER
JONES
SHACKELFORD
STEPHENS
PALO PINTO
PARKER
TARRANT
FORT WORTH
DALLAS
DALLAS
NOLAN
TAYLOR
CALLAHAN
EASTLAND
ERATH
COKE
RUNNELS
COLEMAN
BROWN
COMANCHE
1945 DEVELOPMENTS IN NORTH AND WEST-CENTRAL TEXAS
Scale 1" = 38 miles
0
38 miles
LEGEND
WILDCATS PRODUCING OIL
WILDCATS PRODUCING GAS
EXTENSIONS PRODUCING OIL
EXTENSIONS PRODUCING GAS

FIG. 1

TABLE I

NEW POOLS AND EXTENSIONS DISCOVERED IN 1945

Index No.	County	Field	Operator	Farm and Well No.	Location	Class	Producing Formation	Depth of Producing Formation (Feet)	Depth Total (Feet)	Daily Initial Production (Bbls.)	Method of Exploration
1	Archer	Olney	Burns	Benson "E" 1	1,808, TE&L	New	Bend ls.	4,594 (6)	5,428	75 P	Sub.-Trend
2	Archer		Burns	Campbell 1	1,388, TE&L	New	Miss. ls.	5,085 (12)	5,097	151 P	Seis.
3	Archer		Burns	Parsons 1	688, 1, EL&RR	New (Ext.)	Cisco	1,488 (7)	1,495	10 P	Sur.-Sub.
4	Archer		Cochran & Cain	Richardson 1	11, T. McCoy, 269	New	Cisco	1,144 (19)	1,163	9 P	Trend
	Archer		Cooper	Perkins "B" 1	20, 3, Denton, CSL, 117	New (Ext.)	Strawn	4,073 (12)	4,085	169 F	Trend
6	Archer		Gorman	Jackson 1	20, ATNCL	New (Ext.)	Cisco	1,397 (5)	1,402	48 P	Trend
7	Archer	Gose	Gray & Seaboard	Gose 1	8, ATNCL	Out. (Ext.)	Cisco	1,603 (17)	1,620	15 P	Trend
8	Archer	Holliday	Kadane	Perkins "A" 1	J. C. Keith, 1,012	Out. (Ext.)	Strawn	4,071 (14)	4,085	508 F	Sub.
9	Archer		King	Perkins 1	72, KWVFL	Out. (Ext.)	Cisco	1,612 (2)	1,614	55 P	Sub.
10	Archer		Manning	Mahler "A" 2	18, H&TC	Out. (Ext.)	Ell.	5,500 (20)	5,602	10 P	Sub.
11	Archer		Manning	Nichols 1	2, 50, ATNCL	New	Ell.	5,486 (20)	5,543	408 F	Trend
12	Archer		Phillips	Bullington 1	M. Doyle, 120	Out. (Ext.)	Ell.	5,233 (182)	7,915	348 F	Sub.-Seis.
13	Archer		Robertson	Richardson 1	14, J. Scott, 374	New	Bend ls.	4,702 (8)	5,222	1,688 F	Sub.
14	Archer	Megargel	Scholl	Richardson 1	2,424, TE&L	New	Cisco	1,434 (8)	1,442	10 P	Sub.
15	Archer		Timberlake	Wolfe 1	SPRR, 415	New (Ext.)	Cisco	1,348 (16)	1,371	2 P	Trend
1	Brown		Central Texas Gas Co.	W. Cason 1	J. M. Baker	Out	Canyon	1,247 (10)	1,259	496	Sub.
1	Clay		Anderson & Prichard	Wood "A" 1	12, MEP&P, 339	New	Bend cgl.	5,935 (15)	6,672	384 F	Seis.
2	Clay	Antelope	Breedon	Berry 1	2,626, TE&L, 485	Out. (Ext.)	Strawn	3,153 (15)	3,172	250 P	Trend
3	Clay		Continental	Heard "C" 1	3,222, T&EL	New	Ell.	6,468 (25)	6,496	1,168 F	Seis.
4	Clay	West Ross	Continental	Morris 1	W. C. Davis, 119	New	Strawn	4,754 (42)	5,870	30 P	Sub.-Seis.
5	Clay		Continental	Thomas 1	34, Freestone CSL, 144	New	Strawn	4,130 (20)	7,106	33 P	Seis.
6	Clay	Halsell	Fain & McGaha	Halsell "B" 1	W. Walker, 703	Out. (Ext.)	Strawn	4,003 (35)	4,038	215 P	Sub.-Seis.
7	Clay		Hammon	Bryans 1	M. F. Simms	New	Bend cgl.	5,862 (34)	6,502	20 P	Seis.
8	Clay	Antelope	Kadane	Oliver 1	2,603, TE&L	Out. (Ext.)	Strawn	3,206 (9)	3,216	12 P	Trend
1	Coleman		Harvey & Henderson	McCord 1	J. W. Week, 159	New	Strawn	3,457	3,880	4 MFC gas	Sub.
2	Coleman		Hunter	Hudson 1-A	D. F. Roddan, 42	New	Strawn	3,613	3,712	64	Sub.
3	Coleman	Gunn	White & Newman	Gunn 1	40, HT&B	New	Strawn	3,380	3,515	11	Sub.
1	Cooke		Anderson	Mooney 1	A. C. C. Bailey, 44	Out.	Strawn	3,933 (10)	3,943	211 P	Trend
2	Cooke		Harper	Randall 1	L. Lawson, 588	New (Ext.)	Strawn	1,590 (14)	1,604	43 P	Trend
3	Cooke		Helms	Blocker 1	A. Rodriquez, 880	New (Ext.)	Cisco	1,588 (4)	1,602	28 P	Trend
4	Cooke	Gatewood	Hollandsworth	Gatewood 1	Wm. Slingland	Out. (Ext.)	Canyon	1,581 (2)	1,583	72 P	Sub.
5	Cooke	Gatewood	Hollandsworth	Mathews 1	R. Ekey, 357	New (Ext.)	Cisco	1,543 (4)	1,548	60 P	Trend
6	Cooke	Wilson	Lynn	Giles 1	Wm. Moore, 628	Out. (Ext.)	Strawn	2,442 (10)	2,452	20 P	Sub.
7	Cooke	Sivells Bend	Magnolia	Dillard 1	D. Martin, 617	Out.	Strawn	7,400 (13)	7,413	1,134 F	Sub.
8	Cooke	Wilson	Magnolia	Mooney 2	A. C. C. Bailey, 44	Deep	Strawn	2,301 (5)	2,306	31 P	Sub.
9	Cooke	Wilson	Magnolia	Mooney 3	A. C. C. Bailey, 44	Deep	Strawn	2,720 (9)	2,729	16 P	Sub.
10	Cooke	Sivells Bend	Mid-Continent	Morris 1	S. Gann, 411	Out. (Ext.)	Strawn	6,896 (13)	6,909	948 F	?
11	Cooke	Gregory	Murray	Gregory	J. M. Randolph, 868	New	Strawn	3,482 (4)	3,486	141 P	Trend
12	Cooke	Almon	Snuggs	Almon 1	J. M. Randolph, 868	New	Strawn	2,899 (8)	2,912	87 P	Trend-Seis.
13	Cooke	Sivells Bend	Sun	Allen 1	S. Gann, 411	Out. (Ext.)	Strawn	6,280 (20)	7,450	252 F	Sub.-Seis.
14	Cooke	Sivells Bend	Sun	Fields 1	M. J. Mason, 346	Out. (Ext.)	Strawn	6,670 (12)	7,024	244 F	Sub.-Sei .
15	Cooke	Sivells Bend	Texas	Beasley 1	J. McKerley, 639	Out.	Strawn	6,817 (46)	6,904	456 F	Sub.-Seis.

TABLE I—(*continued*)

Index No.	County	Field	Operator	Farm and Well No.	Location	Class	Producing Formation	Depth of Producing Formation (Feet)	Total Depth (Feet)	Daily Initial Production (Bbls.)	Method of Exploration
1	Eastland		Kerlyn	Harrelson 1	101, 3, H&TC	New	Bend	3,286	3,819	4 MFC gas	Seis.
1	Jack		Continental	Borden 1	E. J. Wilson, 1,729	New	Ell.	6,720 (140)	6,927	624 F	Seis.
2	Jack		Continental	Hooten 1	9, 2, Henderson CSL		Bend ls.	4,365 (65)	5,000	4 Mil gas	?
3	Jack		Hanlon-Buchanan	Mathis 1	G. W. Davis, 187	Out.	Bend cgl.	4,758 (10)	4,768	397 F	Sub.
4	Jack		Hanlon-Buchanan	Shown 1	J. Irvine, 312	New (Ext.)	Strawn	3,473 (5)	3,478	61 P	Seis.
5	Jack		Hanlon-Buchanan	Whitsitt 1	Wm. McElroy, 1,475	New (Ext.)	Bend ls.	5,115 (21)	5,181	40 P	Sub.-Seis.
6	Jack	Sewell	Humphrey	First State Bank 1	2, BS&F, 2,248	Out.	Caddo ls.	4,015 (27)	4,681	25 F	Sub.
7	Jack		Panhandle	Cherryhomes 1	R. S. Gorder, 126	New	Caddo	5,035 (15)	5,091	168 F	Seis.
8	Jack		Panhandle	Smith 4	I. Hughson, 256	Deep	Caddo	4,533 (19)	4,552	50 F	Trend
9	Jack	Risch	Roesser & Pendleton	McAnnally 1	18, Henderson CSL, 275	New (Ext.)	Bend cgl.	4,430 (5)	4,446	360 F	Sub.-Trend
10	Jack		Steed	Ware 1	3,350, TE&L	New	Bend ls.	4,457 (15)	4,472	112 F	Trend
11	Jack		Stewart	Kinder "D" 1	B. H. Epperson, 208	New	Marble Falls	4,204 (21)	4,652	90 F	Sub.
1	Jones		Crown Cen. Pet.	Stephenson	4, 3, J. Winter, 134	New	Cisco	2,579	2,579	252	Sub.
2	Jones		Eastland Oil Co.	Chittenden 1	19, L. Kratz	Out.	Cisco	3,020 (16)		69	Trend
3	Jones	Noodle	Humble	Horton 1	40, 18, T&P	Deep	Cisco	329	2,932	828	Sub.
4	Jones		Hunt	Amason 2	S. Jones, 266	New	Canyon	3,608	3,608	126	Sub.
5	Jones		Primo	Martin 1	J. Weihl, 13	New	Cisco	1,638	1,638	11	Sub.
6	Jones		Rhodes	Swann 1	I. Miley, 287	Out.	Cisco	2,743	2,953	528	Sub.
7	Jones		Roark & Hooker	Myatt 2	J. Warfield, 10	New	Permian	1,424	1,424	40	Sub.
8	Jones		Roberts	Cooper 1	29, 15, T&P	New	Cisco	2,327 (5)	2,332	451	Sub.
9	Jones		Roberts	Cooper 2	29, 15, T&P	Out.	Cisco	1,989 (15)		1,336	?
10	Jones		Texas Co.	McCright 1	S. Scallon		Cisco	2,518 (28)	2,456	44	Sub.
11	Jones		Travis	Nobles 2	190, B. Travino		Cisco	1,937 (11)	1,948	4	?
1	Montague		Chapman	Fowler "A" 1	7, Limestone CSL, 421	New	Bend cgl.	5,974 (17)	6,038	2,776 F	Trend
2	Montague		Chupp	Armstrong 1	J. Reese, 629	New (Ext.)	Canyon	2,987 (12)	2,999	62 P	Trend
3	Montague	Hildreth	Continental	McCall 1	P. Luck, 430	Out. (Ext.)	Bend cgl.	6,018 (10)	6,300	704 F	Sub.-Seis.
4	Montague	North Hildreth	Dillard	Lawson 1	N. Kimbro, 405	New	Bend cgl.	5,992 (18)	6,157	1,836 F	Seis.
5	Montague	Hildreth	Heinze	Johnson 1	J. Castleberry, 131	Out. (Ext.)	Bend cgl.	5,999	6,284	1,220 F	Trend
6	Montague		Highlander	Gentry 1	J. D. Jennings, 389	Out. (Ext.)	Strawn	4,580 (20)	4,792	536 F	Sub.
7	Montague		Nu-Enamel	Heard "J" 1	W. Doran, 201	Out. (Ext.)	Bend cgl.	5,962 (30)	6,082	156 F	Sub.-Trend
8	Montague		Nu-Enamel	Langford 1	MEP&P, 532	Out. (Ext.)	Basal Penna. cgl.	3,916	3,916	398 F	Trend
9	Montague	Hildreth	Nu-Enamel	Posey 1	J. Castleberry, 131	Out. (Ext.)	Bend	5,950 (30)	6,247	846 F	Trend
10	Montague	East Stoneburg	Omohundro	Johnson 1	6, Limestone CSL, 421	New	Bend cgl.	5,996 (22)	6,145	1,856 F	Seis.
11	Montague		Texas	Hutson 1	G. W. Fletcher, 280	New	Cisco	1900 (2)	4,185	78 P	Sub.
12	Montague	Belcherville	Vernmex	Beakley 1	21, M. Garnett	New	Bend cgl.	5,346 (10)	5,913	928 F	Seis.
13	Montague		Venmex	Kingsbury 1	B. Anibal, 1,058	New (Ext.)	Bend cgl.	5,030 (32)	6,197	1,608 F	Trend-Seis.
1	Nolan		Sohio	Faver 1	5, 50, T&P	New	Strawn		5,836	50	?
1	Shackelford		Eltex	Davis 1	57, 13, T&P	New	Cisco	1,812	1,812	3 MCF gas	Sur.
2	Shackelford		Harvey & Henderson	Nail 1	129, ETRR	Out.	Cisco	1,315 (9)	1,324	62	?
3	Shackelford		Key	Green 1	21, 12, T&P	New	Strawn	3,023	4,451	99	?
1	Stephens		American Mfg. Co.	Rogers 1	27, 5, T&P	Deep	Ell.	4,470 (43)	4,513	92	?
2	Stephens		Mudge	Adams 1	2,955, TE&L	New	Miss. ls.	3,906	4,247	gas	Sub.

TABLE I—(*continued*)

Index No.	*County*	*Field*	*Operator*	*Farm and Well No.*	*Location*	*Class*	*Producing Formation*	*Depth of Producing Formation (Feet)*	*Total Depth (Feet)*	*Daily Initial Production (Bbls.)*	*Method of Exploration*
3	Stephens	Tipton	Sinclair Prairie	Tipton 1	2,960, TE&L	New	Ell.	4,164	4,164	6	Sub.
4	Stephens		Skeen	Hatchett 1	33, OAL	New	Ell.	4,228	4,228	360	Sub.
5	Stephens		Texas	Parks 47-A	3,373, TE&L	Deep	Ell.	4,150 (4)	4,154	9	Sub.-Trend
6	Stephens		Woodley	Thorp 1-B	456, SPRR	Deep	Miss. ls.	3,745 (75)	3,820	45	Sub.
1	Throckmorton		Panhandle	Ewalt 2	2,185, TE&L	New	Miss. ls.	4,802 (5)	5,029	50 P	Sub.-Seis.
2	Throckmorton		Panhandle	Hardy 1	3,005, TE&L	Out. (Ext.)	Bend cgl.	4,788 (65)	4,900	125 F	Sub.
3	Throckmorton		Stewart	Tharp 1	3,007, TE&L	Out.	Bend ls.	4,260 (10)	4,885	171 P	Sub.
4	Throckmorton		Manning	Atkinson 1	961, TE&L	New	Bend ls.	3,903 (2)	3,905	518 F	Sub.
1	Wichita		Christie	Waggoner 8	1, GC&SF, 531	Out. (Ext.)	Cisco	1,019 (5)	1,790	15 P	Sub.-Trend
2	Wichita		Consolidated	Jones & Payne 1	BBB&C, 30	Out.(Ext.)	Strawn ls.	4,194 (12)	5,138	65 P	Trend
3	Wichita	Burkburnett	Fortex	Evans 1	L. B. Taliaferro, 541	New	Cisco	1,301 (8)	1,650	18 P	Trend
4	Wichita		Hammon	Boone 1	29, Southside	Out.	Strawn	4,171 (39)	4,210	1,200 F	?
5	Wichita		Knight	Volkart 1	303, Waggoner Col.	Out. (Ext.)	Cisco	1,707 (3)	1,710	9 P	Trend
6	Wichita		Knight	Scales 1	304, Waggoner Col.	New	Cisco	1,705 (10)	2,083		
1	Wilbarger		Andrade	Castleberry 1	66, 14, H&TC	Out. (Ext.)	Cisco	1,107 (11)	1,145	6 P	Sub.
2	Wilbarger	Harrold	Big Six	Schlafke "A" 1	3, 14, H&TC	Deep	Miss. ls.	4,830 (44)	5,146	62 F	Sub.-Seis.
3	Wilbarger	Fargo	Humble	Munn	45, 15, H&TC	Out. (Ext.)	Canyon ls.	4,510 (40)	5,118	27 P	Sub.
4	Wilbarger	Harrold	L.&M.	Kelly	34, 13, H&TC	Out. (Ext.)	Strawn ls.	4,316 (14)	5,409	70 P	Sub.
5	Wilbarger	National	National Associated	Havens 1	31, 13, H&TC	Out.	Canyon ls.	3,163 (10)	3,707	422 F	Sub.
6	Wilbarger	National	National Associated	Kelly "A" 1	30, 13, H&TC	New	Ell.	4,910 (16)	4,926	130 F	Sub.-Seis.
7	Wilbarger	National	National Associated	Kelly "B" 1	36, 13, H&TC	Out.	Canyon ls.	3,646	3,679	300 F	Sub.
1	Young		Burns	Crain 1	169, TE&L	New	Miss. ls.	4,938 (17)	4,955	1,440 F	Seis.
2	Young		Burns	Larimore "A" 2	150, TE&L	Out.	Strawn	3,319 (4)	3,323	75 P	Seis.
3	Young	Prideaux	Fain & McGaha	Prideaux 2	A. Rohus, 240	Out. (Ext.)	Strawn	3,622 (15)	3,637	402 F	Sub.
4	Young		Fleming	Graham-Tankersly	741, TE&L	New (Ext.)	Strawn	3,397 (28)	4,947	25 P	Seis.
5	Young		Fleming	Sweeney 1	2,917, TE&L	New	Strawn	2,880 (10)	4,725	6 P	Trend
6	Young		Grace	Stovall 2	495, TE&L	Deep	Miss. ls.	4,655 (25)	4,680	10 P	Sub.
7	Young		Humphrey	Stephens 1	3,412, TE&L, 13	Out.	Strawn	2,730 (22)	4,500	38 P	Trend
8	Young		Hunter	Roach 2	304, TE&L	New	Cisco	1,220 (7)	1,227	10 P	Trend
9	Young		Kerlyn	Barouset 1	A. Wood, 1,274	New	Miss. ls.	5,041 (7)	5,170	2,400 F	Sub.
10	Young		Kerlyn	Bryan 1	1,902, TE&L	New	Bend ls.	4,373 (8)	5,576	400 F	Seis.
11	Young	Ker-Ward	Kerlyn	Edwards 1	1,481, TE&L	New	Miss. ls.	5,105 (8)	5,113	774 F	Sub.-Seis.
12	Young		Kerlyn	Garvey 1	Compere, 1,719	Out. (Ext.)	Bend ls.	4,255 (22)	4,628	64 P	Sub.
13	Young		Lesco	Slater 1	463, TE&L	New	Bend	3,893 (7)	3,900	50,4 Mil gas	Sub.
14	Young		Maguire	Bernhardt 1	1,474, TE&L	Out.	Bend ls.	4,393 (10)	4,489	175 F	Sub.
15	Young		Maguire, Hanlon-Buchanan	King 1	455, TE&L	Out.	Miss. ls.	4,779 (16)	4,795	331 F	Trend
16	Young		Manning	Graham 1	1, J. Poitevent, 227	New	Strawn	3,075 (15)	3,090	100 F	Sub.
17	Young		Republic	Edwards 1	3,401, TE&L, 1,221	New (Ext.)	Miss. ls.	5,123 (20)	5,143	360 F	Sub.
18	Young		Robertson	Burch 1	466, TE&L	New	Strawn	3,794 (20)	4,791	46 P	Trend
19	Young		Sohio	Garvey 2	1, BBB&C, 35	Out.	Miss. ls.	5,186 (30)	5,340	465 F	Trend
20	Young		Watson	Choate 1	254, TE&L	New	Cisco	610 (10)	620	6 P	Trend

Explanation.

Under "Location": arranged in order as follows: Lot number, Section number, Block number, Survey name, Abstract number.

Under "Class": New, new pool; Ext., extension; Out., outpost; Deep, deepening.

Under "Depth of Producing Formation": Figures in parenthesis indicate pay thickness. Figures where not accompanied by other figures in parenthesis indicate base of producing formation rather than top.

Under "Daily Initial Production": P, pumped; F, flowed; MCF, million cubic feet of gas per day.

Under "Method of Exploration": Sub., subsurface; Seis., seismic; Sur., surface.

formation were recorded in 1945, but the most notable development is the northwest extension of the Hildreth field. To date, the northwest extent of this field is still undefined, and scattered outposts indicate that an additional 1,500 acres might still be productive. Although some of the outposts were drilled on seismic anomalies, the productivity of the Bend conglomerates seems to depend for the most part on reservoir conditions rather than on structural position. Several of the successful outposts could conceivably develop into pools of major proportions.

6. Of considerable geologic interest was the discovery by the Continental Oil Company's Heard "C" No. 1 of Ellenburger dolomite production in the Fort Worth basin in southeastern Clay County. This is the first time the "true" Ellenburger has been found productive in the Fort Worth basin, and also, it is the first time the Ellenburger has produced a natural flow, although acidizing did increase its initial flow. It appears that this discovery also found a potential reservoir within the Bend limestone, since a drill-stem test of that zone yielded 1,435 feet of oil and recorded a bottom-hole pressure of 2,000 pounds per square inch.

7. In southeastern Wichita County two wildcats were successfully completed from a porous sandstone in the upper part of the Strawn series. Subsequent development indicates that the two discoveries are producing from the same reservoir, which is a sand and sandy oölitic limestone probably directly correlative with the Strawn producing zone in the K.M.A. pool. At places this reservoir attains a thickness of 40 feet. So far the pool is limited only on the southeast, and it may be one of the outstanding discoveries of 1945. Seventeen wells have been completed.

8. In the West pool, 2 miles northwest of Wichita Falls, seven successful completions were recorded during 1945. Dry holes have outlined the pool in all directions except northeastward, eastward, and southward, but edge wells seemed to have nearly defined this pool in all directions.

9. The shallow, Cisco producing Krohn field north of Electra now contains 25 producing wells, most of which are maintaining their allowables, and most of which were completed with relatively high initial potentials.

10. Another discovery of considerable geologic interest was the Phillips Petroleum Company's Bullington No. 1 in northeastern Archer County, which produced oil from the upper 182 feet of Ellenburger dolomite. However, before completion, this test drilled completely through the Ellenburger section, 2,609 feet in all, into a metamorphosed conglomerate which is considered by some to be a Reagan sandstone equivalent. This is the most complete section of Ellenburger cut by a single well in the North Texas area.

11. Another very important discovery with a series of subsequent discoveries was the National pool, one mile east of the town of Harrold in Wilbarger County. This field, situated on the north flank of the Electra arch, now produces from the Canyon and Strawn limestones and the Ellenburger dolomite. A subsurface

and seismic discovery, this pool has had an orderly development, and at the end of 1945 contained eight producers. Its limits are undefined, and its reserves will add substantially to those of Wilbarger County.

12. The Ewalt discovery in eastern Throckmorton County, recorded in 1944, instigated considerable drilling which resulted in three discoveries of questionable importance. The Mississippian limestone was found productive in two closely associated areas, and Bend limestone in one. At the end of 1945, seven producers and three failures had been completed.

13. What appears to be prolific, though localized, Mississippian limestone production was discovered by Burns' Crain No. 1 in north-central Young County. The south offset to this seismic discovery blew out, and operators were forced to plug it when brought under control. Three wells are now producing, and the field is undefined, but since very few of the Mississippian limestone fields cover a wide area, this is not anticipated to be a major discovery.

14. A Strawn sandstone discovery was completed in the old Prideaux Swastika sand pool in northeastern Young County. This discovery was made on the basis of shallow subsurface markers, and demonstrates the reliability of such mapping in this area.

15. Considerable development occurred on the southeast flank of the Joy pool, and the south flank of the Antelope pool in southwestern Clay County. By the end of 1945, 17 wells on the former and 27 wells on the latter were producing from Strawn sandstones, considered by many to be updip pinch-outs. The north flank of Joy has received some development, and none of these flanking pools has been completely defined.

16. Major note of interest in the west-central Texas district was the continued development of and the additional reserves located in the shallow Cisco sandstones in Jones County. Many of the discoveries were based on subsurface mapping of shallow limestone beds, although some were old-pool deepenings.

Of the failures drilled in north and west-central Texas, several revealed geologic information which will aid materially in future exploration. Of these, the following should be noted.

(1) Nu-Enamel's Agee No. 1 in northeastern Montague County. This test is located far down the southwest flank of the Nocona-Seay anticlinal extension (Muenster arch), but encountered the pre-Cambrian complex in place of the Ellenburger dolomite which was normally anticipated. No Ellenburger was present, but a long section of porous granite wash was revealed.

(2) In northwestern Clay County, the Perkin's Stine No. 1 and Jenning's Kempner No. 1 failures assisted materially in limiting the major fault which apparently exists south of the Petrolia uplift. The Kempner test encountered pre-Pennsylvanian sediments approximately 3,300 feet structurally lower than the Stine test, 2 miles northward, encountered pre-Cambrian. This, to date, is the nearest this fault has been defined by actual drilling.

(3) The Pure Oil Company's Light No. 1, in northwestern Collin County, a

failure which reached the pre-Pennsylvanian, revealed very poorly developed reservoir beds and may discourage exploration in that part of the county.

The discoveries, including extensions, outposts, and deepenings, in north and west-central Texas, numbered 125: one from the Permian, 28 from the Cisco, 7 from the Canyon, 36 from the Strawn, 31 from the Bend (including "Caddo" and Marble Falls limestone), 12 from the Mississippian limestone, and 10 from the Ellenburger dolomite.

The discovery methods responsible for the tabulated discoveries, extensions, *et cetera*, are the following: 49 subsurface, 16 seismic, 31 on trend, one on surface, and 20 a combination of the foregoing. Some of those accredited to "trend" were drilling obligations and random drilling. Most of the combinations included seismic, so that subsurface and seismic constituted the major type of exploration. A factor that should be noted is the large number of discoveries which were based on shallow subsurface mapping. The reliability of shallow markers as structural mapping units is clearly demonstrated, and it is anticipated that shallow discoveries will continue to be an important factor in ultimate reserves.

Although the successful development continued as usual along the major anticlinal trends, for example, the Bend arch, Electra arch, and Wilbarger arch, interest was manifested in the western area of the North Texas district by numerous wildcat tests. Although very little of consequence was found in 1945, interest will probably be maintained in that province.

The following tabulation concerns the amount and types of exploratory methods in North Texas.

Date	*Seismograph*	*Core Drills*	*Gravity*	*Magnetometer*
July 1, 1945	13	1	3	1
Dec. 31, 1945	18	1	1	0

Field exploration maintained a fairly constant level throughout 1945, although it was an increase over 1944.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6 (JUNE, 1946), PP. 972-979, 1 FIG.

DEVELOPMENT IN SOUTH TEXAS IN 1945[1]

BRUCE SCRAFFORD[2]
San Antonio, Texas

ABSTRACT

The rate of development attained during the closing months of 1944 continued throughout 1945 and accounted for the drilling of 1,618 wells of all categories, exceeding the rate of development of all previous years in this district. Ninety wells were dually completed and two wells triple completed giving a total effective completion of 1,712 wells. Four hundred and seventy-nine wildcat wells were drilled resulting in the discovery of 47 new fields and the extension of 37 producing areas. The total production of 132,923,000 barrels of oil, 7.7 per cent of the United States total production and 17.7 per cent of that produced in Texas, came from the fields of the South Texas district, establishing a new record. The Frio-Vicksburg trend accounted for 47 per cent of the new fields discovered as well as the greater part of field development and production in the district. The discovery of the Borregas and Monte Negra fields of Kleberg County appears to make inevitable an eventual merger of the producing areas of the Agua Dulce, Stratton, Seeligson, Tijerina, Canales, and Blucher fields. The combination of these structures will extend through parts of three counties, approximately 45 miles in length and 3 to 7 miles in width. Six oil and 7 gas-distillate discoveries were encountered in the lower Eocene trend, while the Yegua-Jackson formations of the upper Eocene trend accounted for 7 new oil fields and one gas field. Exploratory drilling found only one oil and 3 gas structures of minor reserve importance in the Cretaceous.

INTRODUCTION

The South Texas district, embracing the 59 counties shown on Figure 1, is the area referred to by the Railroad Commission of Texas Oil and Gas Division as Districts 1, 3, and 4.

For convenience, because of the large size of the South Texas district, development in this area has been subdivided into stratigraphic divisions based on the geologic age of the various production trends. These subdivisions, previously suggested by Kidd, are as follows:[3] (1) the Ordovician and Pennsylvanian of the Edwards Plateau; (2) the Cretaceous of the Balcones Fault zone; (3) the Wilcox, Carrizo, Queen City, and Sparta of the lower Eocene trend; (4) the Yegua and Jackson of the upper Eocene; (5) the Frio-Vicksburg group of the basal Oligocene; and (6) the upper Oligocene and lower Miocene of the coastal area, including the *Marginulina*-Frio, Catahoula, and Oakville.

DEVELOPMENT

Since 1942 the annual rate of development in the South Texas district has steadily mounted, each year establishing a new record and appearing to be the maximum rate attainable. However, the rate of development achieved during the last few months of 1944 continued throughout most of 1945 and accounted for the drilling of 1,618 wells of all category, 217 more than were drilled during the previous year. A shortage of materials necessary for the drilling and com-

[1] Manuscript received, March 15, 1946. Presented by title before the Association at Chicago, April 2-4, 1946.

[2] Consulting geologist, 1610 Alamo National Bank Building.

[3] Gentry Kidd, "Developments in South Texas, 1938-1939," *Bull. Amer. Assoc. Petrol. Geol.*, Vol. 23, No. 6 (June, 1939), pp. 860-70.

pletion of well retarded somewhat the rate of development toward the end of the year.

Of the 1,618 wells drilled in this district, 479 were exploratory tests, wildcat and semi-wildcat wells, while the remaining 1,139 tests were drilled in productive areas. Ninety wells were dually completed and two wells triple completed, separate zones producing through a single well bore, giving a total completion of 1,712 wells. One thousand eighty-six wells, or 63.5 per cent of the total, were completed as oil or gas wells while the remaining 626 were abandoned. Eighty-three per cent of the wells drilled in proved areas were completed as producers while only 18 per cent of the exploratory tests were successfully completed either as discovery or extension wells.

The four hundred seventy-nine exploratory tests accounted for the discovery of 47 new fields as well as the extension of 37 producing areas. The new discoveries for the year of 1945 are exhibited on Table I. Figure 1 shows the location of the new fields discovered, fields extended and fields in which new producing zones were encountered during the year. Exploratory drilling took place in 46 of the 59 counties shown on Figure 1.

PRODUCTION

Production from the pools of South Texas again established a new all-time high for the area as 132,923,000 barrels of oil were produced, 7.7 per cent of the total produced in the year in the United States and 17.7 per cent of that produced in Texas. While it is the opinion of engineers that many of the fields are being produced in excess of the maximum efficient rate, there remain other fields that have not as yet reached the maximum point of production. Additional pipe-line facilities are now in the process of completion that will enable a more equitable rate of withdrawal from the various pools.

New markets for natural gas from the South Texas district are making the operators more conscious of this commodity that has in the past been considered a waste by-product. No accurate records as to quantity of gas produced for market are available but the figure has multiplied several times during the past few years.

EDWARDS PLATEAU

The Edwards Plateau area has remained relatively dormant throughout the year. Only six tests were drilled in this trend, all of which were unsuccessful.

CRETACEOUS FAULT LINE

The interest in the deep Edwards possibilities, activated by the discovery of the Imogene field and the Charlotte field of Atascosa County, was found to continue throughout 1945. Seventy-three exploratory tests, 16.5 per cent of the South Texas total, resulted in the discovery of three gas fields and one oil field. Although the reserves uncovered by these discoveries may individually be of

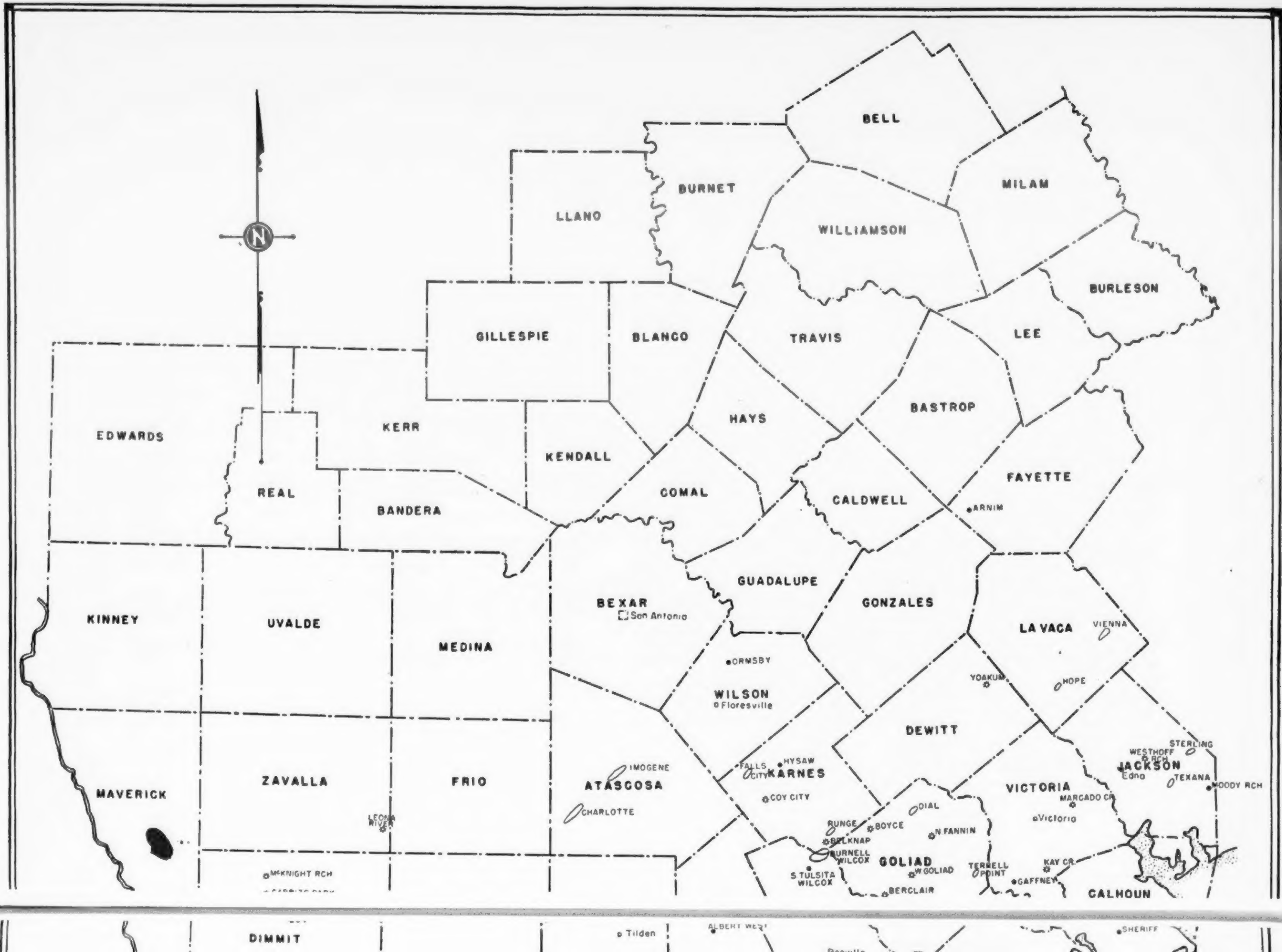
TABLE I

SOUTH TEXAS FIELDS DISCOVERED IN 1945

County and Field	Type	Completion Date	Discovery Well	Survey	Depth of Prod. Form. (Feet)	Initial Prod. (Bbls./Day)	Choke (Frac. of Inch)	Producing Trend
Bee:								
South Blanconia	Gas-Dist.	9-26-45	Sam Chamberlain, H. C. Wood 1	J. M. Castillo	5,239	330,000 MCFG	Open Flow	Frio-Vicksburg
So. Tulsita-Wilcox	Oil	2-24-45	Fred Shield, J. L. Courtney 1	George A. Kerr, A-209	7,048	284	3/16	Wilcox
Theis	Oil	9-19-45	Tom Graham, A. Theis et al. 1	R. S. Barnes, A-115	3,567	105	3/16	Jackson-Yegua
Brooks:								
Gyp Hill	Gas	6- 3-45	Texas Co., Mary Lasater 3	La Blanca	6,656	4,500 MCFG	Open Flow	Frio-Vicksburg
Mariposa	O&G Dist.	4- 1-45	Humble O&R Co., D. J. Sullivan 1	N. D. Floyd, A-152 (Dual)	7,740 & 8,537	12,500 MCFG & 293.9	Open Flow & 1/8	Frio-Vicksburg
Pita	Gas-Dist.	10-18-45	Humble O&R Co., D. J. Sullivan 1-B	San Antonio de Encinal	8,173	6,700 MCFG	Open Flow	Frio-Vicksburg
Rachal	Gas	8-30-45	Humble O&R Co., B. A. Skipper, Jr., 1	La Encatanda	6,100	6,500 MCFG	Open Flow	Frio-Vicksburg
Calhoun:								
Sheriff	Oil	11- 5-45	Quintana, Shofner Estate 1	B. Rodriguez, A-33	5,710	74.25	1/8	Frio-Vicksburg
Dewitt:								
Yoakum	Gas	6-21-45	Pure Oil Co., M. E. Rice 1	James May, A-33	8,160	84,000 MCFG	Open Flow	Wilcox
Dimmit:								
Carrizo Park	Gas	11-10-45	Humble O&R Co., Mrs. H. H. Davis 1	T&NO 15	2,710	5,750 MCFG	Open Flow	Cretaceous
McKnight Ranch	Gas	8- 1-45	Calatexia Oil, McKnight 1	I&GN 35, A-901	2,640	1,300 MCFG	Open Flow	Cretaceous
Duval:								
East Longhorn	Oil	2-10-45	Miller & Sons, George Herberger 1	Stantos Flores, A-213	5,840	72	9/64	Jackson-Yegua
Gormac	Oil	3- 2-45	Gorman & MeDermott, J. F. Welder Est. 2	J. Poitevant 211	2,470	107	1/4	Jackson-Yegua
Rosalia	Gas	6- 8-45	Cox & Hammond, C. Driscoll 3	Sec. 46, Rosalia Grant	3,160	16,200 MCFG	Open Flow	Jackson-Yegua
Fayette:								
Arnim	Oil	2-13-45	Continental Oil, E. A. Arnim, Jr., 1	J. S. Menefee 1/3 League	2,050	80	Pump	Wilcox
Goliad:								
Berclair	Gas-Dist.	11-30-45	Magnolia Petr. Co., R. F. Irby 1	Joseph Callahan	9,905	4,100 MCFG & 64 bbls. distillate	Open Flow	Wilcox
Boyce	Gas-Dist.	3-31-45	Magnolia Petr. Co., W. W. Boyce 1	CCSD&RGNG, A-343	7,470	110,000 MCFG	Open Flow	Wilcox
North Fannin	Oil	1-27-45	Amerada, Albert Waitschies 1	E. J. Armstrong, A-53	5,920	22	1/4	Jackson-Yegua
West Goliad	Oil	2-25-45	Sun Oil Co., R. A. Thompson 1	Igna Guajardo, A-127	11,165	317.64	3" dr. pipe	Wilcox
Hidalgo:								
Santa Maria	Gas	7-19-45	La Gloria Corp., So. Mercedes Unit 1	Capisallo District S/D	8,854	36,000 MCFG	Open Flow	Frio-Vicksburg
Jackson:								
Moody Ranch	Oil	5-18-45	Crown Central Petr., W. L. Moody Jr., 1	Nancy McFarland, A-42	8,832	77.68	6/64	Frio-Vicksburg
Westhoff Ranch	Gas	2- 9-45	Stewarts, A. E. Westhoff et al. 1	J. Rector (Dual)	5,964 & 5,431	3,100 MCFG & 2,150 MCFG	1/4	Frio-Vicksburg
Jim Wells:								
Naylor	Gas	9-10-45	H. M. Naylor Oil Co., Lillian Muil 1	Los Presenos	3,974	12,000 MCFG	Open Flow	Frio-Vicksburg
Ramon	Oil	3-27-45	Bridwell Oil Co., Ramon Garcia 1	La Trinidad, A-300	4,376	156	1/4	Frio-Vicksburg
Karnes:								
Belknap	Gas-Dist.	2-15-45	Phillips & Sohio, W. P. Belknap 1	Charles Haynes, A-147	7,031	3,600 MCFG & 108 bbls. dist.	1/4	Wilcox
Coy City	Gas-Dist.	2-28-45	Seaboard Oil Co., Sally Treadwell 1	Henry S. Brown, A-32	7,144	2,300 MCFG & 155 bbls. dist.	Open Flow	Wilcox

TABLE I—(*continued*)

County and Field	*Type*	*Completion Date*	*Discovery Well*	*Survey*	*Depth of Prod. Form. (Feet)*	*Initial Prod. (Bbls/Day)*	*Choke (Frac. of Inch)*	*Producing Trend*
Hysaw	Oil	9- 8-45	Seaboard Oil Co., E. N. Hysaw 1-A	E. Seguin, A-10	3,973	102	1/8	Wilcox
Kleberg:								
Borregas	Oil	12-14-45	Humble O&R, King Ranch-Borregas 1	Santa Gertrudis	6,889	108	1/8	Frio-Vicksburg
Monte Negra	Oil	12-11-45	Humble O&R, King Ranch-Monte Negra 1	Santa Gertrudis	7,065	167.95	1/8	Frio-Vicksburg
Ricardo	Oil	1-28-45	Tide Water Oil Co., E. House et al. 1	Sec. 36, KT&I S/D	7,266	208	1/8	Frio-Vicksburg
Riviera (Baffins Bay)	Gas-Dist.	7-10-45	Southern Minerals, Leo Kaufer 1	Kochs S/D	7,465	3,367 MCFG & 42.34 bbls. dist.	1/4	Frio-Vicksburg
Live Oak:								
Hinnant	Oil	7-21-45	Wright Drg. Co., M. A. Hinnant 1	Ed Quinn, A-388	5,772	78.3	5/64	Jackson-Yegua
Albert West	Oil	7- 6-45	Continental Oil Co., Albert West 2-A	M. Garonick, A-135	6,720	103	9/64	Wilcox
Kittie West	Gas-Dist.	3-18-45	Continental Oil, K. W. Schreiner 1	D. R. Fant 4, A-523	6,705	7,500 MCFG & 46 bbls. dist.	Open Flow &¼	Wilcox
San Patricio:								
Maedgen	Gas	8- 7-45	H. H. Howell, C. A. Maedgen 1	MPJ&N Delgado	3,250	20,000 MCFG	Open Flow	Frio-Vicksburg
Willman	Oil	6- 5-45	Bridwell Oil Co., Hertha Willman 1	MPJ&N Delgado, A-4	4,554	132	1/8	Frio-Vicksburg
Starr:								
Flores	Oil	6-13-45	Sun Oil Company, M. S. Flores 1	Porcion 40	5,845	46	Pump	Frio-Vicksburg
Victoria:								
Gaffney	Oil	2-10-45	Jas. Stewart & Co., Mrs. Grace Gaffney 1	J. Flores, A-29	5,017	50	5/32	Frio-Vicksburg
Kay Creek	Gas	8-23-45	Chicago Corp., J. A. McFaddin Est. A-1	Jules Vairn	5,223	No gauge	1/4	Frio-Vicksburg
Victoria:								
Marcado Creek	Gas	12-12-45	Taylor Rfg. Co., Raymond F. Meyer 1	A. Peets, A-275	4,720	8 MCFG	Open Flow	Frio-Vicksburg
Webb:								
North Albercas	Oil	12-22-45	Blanco & Buchanan, A. M. Bruni 1	Albercas	2,313½	81.1	Pump	Jackson-Yegua
Staggs	Oil	6-24-45	Tom Graham, Cole Petr. Co. 1	M. Arispi, Blk. 5, Lot 1	2,802	102	9/64	Jackson-Yegua
Willacy:								
Raymondville	Oil	1- 9-45	Texas Company, Yturria Bros. 2	Carricitos	6,380	47	1/9	Frio-Vicksburg
Wilson:								
Ormsby	Oil	3-29-45	L. D. Ormsby, Williamson Hrs. 1	M. Contis	5,028	8 plus 92 bbls. water	Pump	Cretaceous
Zapata:								
Echols	Gas	5-26-45	Geo. H. Echols, T. Dominguez 1	Porcion 31	1,948	SI Gas well—no gauge		Queen City
McDermott	Oil	1-11-45	Humble O&R Co., J. V. McDermott 1	Porcion 14	2,609	96—25% oil 75% wtr.	1/4	Wilcox
Zavala:								
Leona River	Gas-Dist.	2- 5-45	Texas Co., Nat. Bk. Comm. (West) 1	E. A. Wolf 6, A-1202	4,214	2,216 MCFG & 18 bbls. dist.	1/4	Cretaceous



N
BELL
MILAM
BURNET
LLANO
WILLIAMSON
BURLESON
GILLESPIE
BLANCO
TRAVIS
LEE
EDWARDS
KERR
HAYS
BASTROP
KENDALL
REAL
COMAL
CALDWELL
FAYETTE
ARNIM
BANDERA
GUADALUPE
BEXAR
San Antonio
GONZALES
KINNEY
UVALDE
MEDINA
LA VACA
VIENNA
ORMSBY
WILSON
Floresville
YOAKUM
HOPE
DEWITT
STERLING
WESTHOFF RCH
JACKSON
Edna
TEXANA
MOODY RCH
IMOGENE
ATASCOSA
CHARLOTTE
FALLS CITY
HYSAW
KARNES
COY CITY
MAVERICK
ZAVALLA
FRIO
LEONA RIVER
VICTORIA
MARCADO CR
Victoria
DIAL
RUNGE
BOYCE
N FANNIN
BELKNAP
BURNELL WILCOX
GOLIAD
W GOLIAD
TERRELL POINT
KAY CR.
GAFFNEY
S TULSITA WILCOX
BERCLAIR
CALHOUN
McKNIGHT RCH
DIMMIT
Tilden
ALBERT WEST
SHERIFF

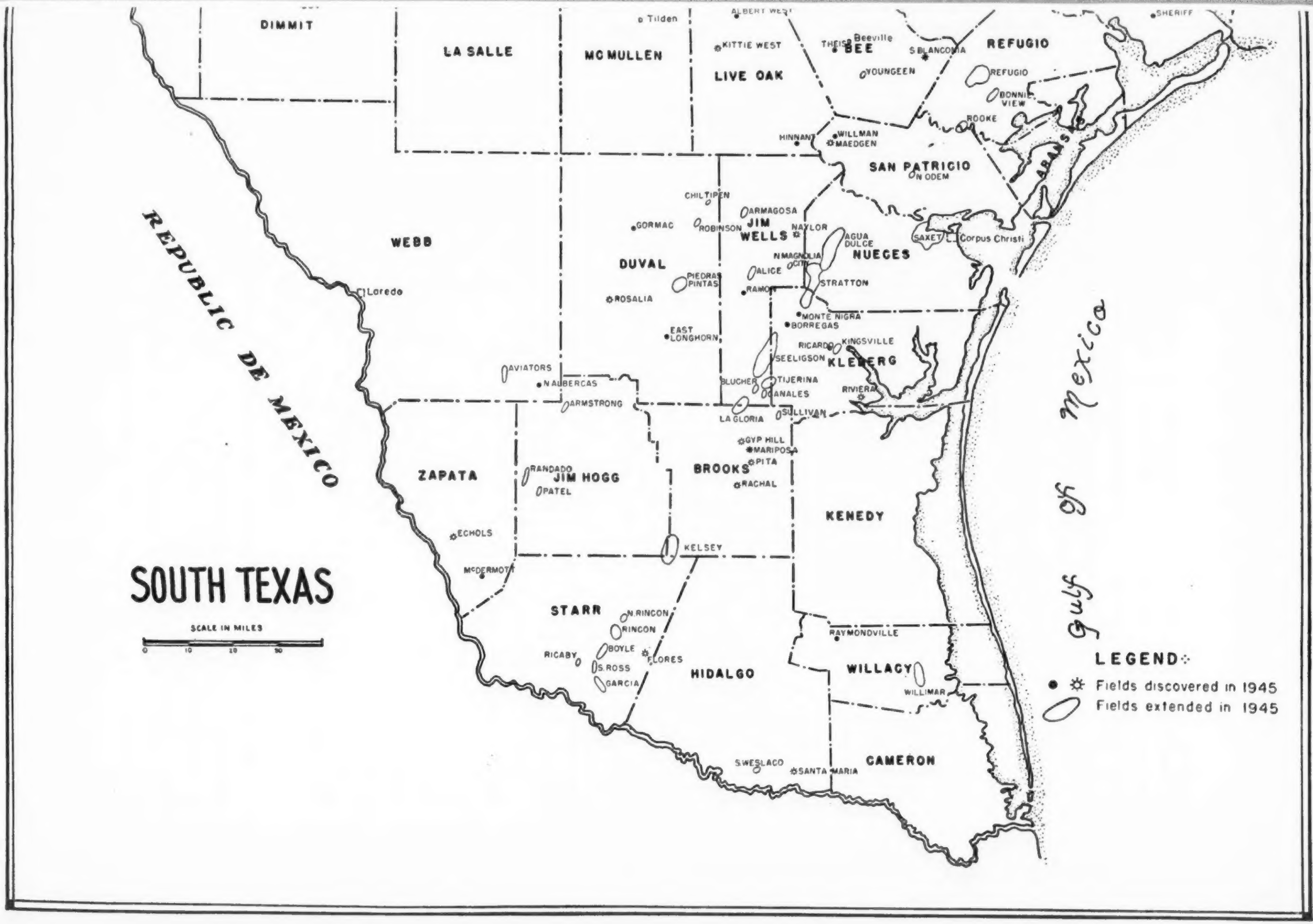


FIG. 1.—Oil and gas fields in South Texas.

relatively minor importance, the fact that these new fields open a large unexplored area may ultimately be significant. The Carrizo Park field and the McKnight Ranch field, both gas productive, were discovered by the Humble Oil and Refining Company and the Calatexia Oil Company, respectively. Progress in the development of this area has been retarded by the lack of transportation facilities for the marketing of either oil or gas.

Exploration of the Lower Cretaceous-Jurassic zone, considered by many geologists to be of major importance as a source for future reserves in this trend, has been slow to progress. The development of Jurassic has been approached with caution not only because of the high cost of drilling these tests, but also with a view to the many stratigraphic and sedimentary problems involved. Although most of the tests that have penetrated this zone have reported showings of either oil or gas, the physical characteristics of the reservoir rocks have not been found to be favorable for production in commercial quantities.

LOWER EOCENE TREND

Exploratory activity in the Wilcox and Queen City formations of the Lower Eocene trend accounted for the discovery of 13 new fields, 28 per cent of the discoveries for the South Texas district. Of the 13 new fields discovered, 6 are oil productive while the remaining 7 are gas-distillate. The exploration development was widely scattered throughout the entire trend. Productive sands in the Wilcox zone were encountered at depths varying from 3,973 feet (Seaboard Oil Company's E. N. Hysaw No. 1-A, oil discovery of the Hysaw field of Karnes County), to 11,165 feet (Sun Oil Company's R. A. Thompson No. 1, the oil producer discovering the West Goliad field of Goliad County). The Sun-Thompson well is the deepest producing well in the Wilcox trend of South Texas to date.

The development of fields discovered prior to 1945 is of major significance in regard to potential reserves of the Lower Eocene trend. The majority of Wilcox fields have been found to possess large gas caps with a relatively thin oil column which is difficult to produce with an acceptable gas-oil ratio and yet free of water. The Falls City field of Karnes County has been proved to be an exception to the foregoing statement in that most of the reservoirs encountered in this field appear to have little or no free gas. The Falls City field has a multiple-reservoir condition, 9 proved productive zones, that should establish this field as one of the few first-class oil reserves in the trend.

UPPER EOCENE

The 102 wildcat wells drilled in the Upper Eocene trend accounted for the discovery of 7 oil-producing fields and one gas field, 17 per cent of the discoveries in the district. The East Longhorn field of Duval County, which appears to be a better-than-average reserve for this trend, was accredited with the completion of 15 wells during the year. A multiple-reservoir condition is present in this field and two of the foregoing wells were dually completed, giving effectively 16 oil

wells and one gas well. The remainder of the upper Eocene fields discovered in 1945 appear to be of minor reserve importance.

FRIO-VICKSBURG

The Frio-Vicksburg trend remains the most active and prolific of the various geological provinces of South Texas. Fifty-six per cent of all wells drilled in the district in 1945 were located in the Frio-Vicksburg trend. One hundred and seventy exploratory tests discovered 22 new fields, 11 oil completions, 12 gas completions, including 2 wells which were dually completed.

Several of the new fields would appear to have excellent possibilities of being major reserves. The Mariposa field of Brooks County, discovered by the Humble Oil and Refining Company's D. J. Sullivan No. 1-B, encountered 27 sands containing gas and one oil sand. The discovery well was dually completed as an oil and gas-distillate producer. The Pita field in Brooks County, discovered by the Humble Oil and Refining Company's D. J. Sullivan No. 1, found 13 sands to be gas productive, indicating at least a large gas reserve for the structure.

The Borregas and Monte Negra fields of Kleberg County, both discovered by the Humble Oil and Refining Company on the King Ranch, appear to make inevitable a merger of production in the Agua Dulce, Stratton, Seeligson, Tijerina, Canales, and Blucher fields. The combination of these structures, all associated with a single regional structural feature, the Vicksburg flexure, will extend through parts of three counties approximately 55 miles in length and 3 to 7 miles in width. Almost 25 per cent of all development wells which were drilled in the district were located in this area.

Several other fields of the Frio-Vicksburg trend were extended both as to area as well as to the addition of new producing formations. The Garcia field of Starr County, also associated with the Vicksburg flexure, was extended by the drilling of 53 wells, 11 of which were dually completed. The Boyle field, North Rincon field, Rincon field, and South Ross fields, all in Starr County, had extensions of noteworthy importance. New producing zones were also encountered in the Kelsey field of Brooks County. The La Gloria field of Brooks and Jim Wells counties has been recognized as structure possessing large gas reserves, but not until this year have the oil possibilities been accorded serious exploration. Development on the flanks of the structure has now established several zones as oil productive and a development campaign is now in progress. Twenty-three new wells were completed in the Bonnie View field of Refugio County while the Willamar field of Willacy County was accredited with 90 completions.

UPPER OLIGOCENE AND LOWER MIOCENE

No new fields were discovered during the year in the Upper Oligocene-Lower Miocene trend. The zone accounted for a gas productive pool in the Willamar field of Willacy County that may revive interest in the productive possibilities of this zone elsewhere in the area.

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VOL. 30, NO. 6 (JUNE, 1946), PP. 980-990, 1 FIG.

DEVELOPMENTS IN EAST TEXAS DURING 1945[1]

T. H. SHELBY, JR.[2] AND G. J. LOETTERLE[3]
Tyler, Texas

ABSTRACT

One new oil-producing area and four new gas-producing areas were discovered in East Texas during 1945. The LaRue area in Henderson County produces oil from the Bacon limestone member of the Rodessa section. The gas-producing areas include Stony Point in Freestone County and Marshall in Harrison County, both of which produce from the Pettit section; Fairfield in Freestone County which produces from the Woodbine and Travis Peak, and Whelan in Harrison County which produces from the Rodessa and Travis Peak.

Deeper drilling in old fields resulted in the discovery of new oil-producing zones in two fields and new gas-producing zones in two additional fields. Shallow oil was found and produced in two old fields.

Exploratory drilling in East Texas was again characterized by deeper tests having the Paluxy, lower Glen Rose, Travis Peak, Cotton Valley, and Smackover formations as their principal objectives. Woodbine exploration was extended into the southern part of the East Texas area.

INTRODUCTION

The oil and gas fields of the East Texas district, which includes forty-four counties in the northeast part of the state, are shown on the accompanying map (Fig. 1). The district boundaries are essentially the outer limits of the East Texas structural basin, which at the southern end of the district gradually loses its identity and merges into the normal gulfward dip of the Gulf Coast area.

There was a marked increase in field drilling activity in the East Texas district in 1945 as compared with 1944, accompanied by a slight decrease in wildcat drilling. A tabular comparison of this activity for the 2 years is shown in Table I.

TABLE I
COMPARISON OF DRILLING ACTIVITY

	1944	1945	1945 Increase	1945 Decrease
Field Wells				
Oil wells	120	150	30	
Gas wells	40	124	84	
Dry holes	39	32		7
Total wells	199	306	107	
Wildcat Wells				
Oil wells	9	1		8
Gas wells	0	4	4	
Dry holes	109	81		28
Total wells	118	86		32
Grand total wells	317	392	75	

[1] Manuscript received, March 29, 1946.

[2] Humble Oil and Refining Company.

[3] Hudnall and Pirtle, consulting geologists.

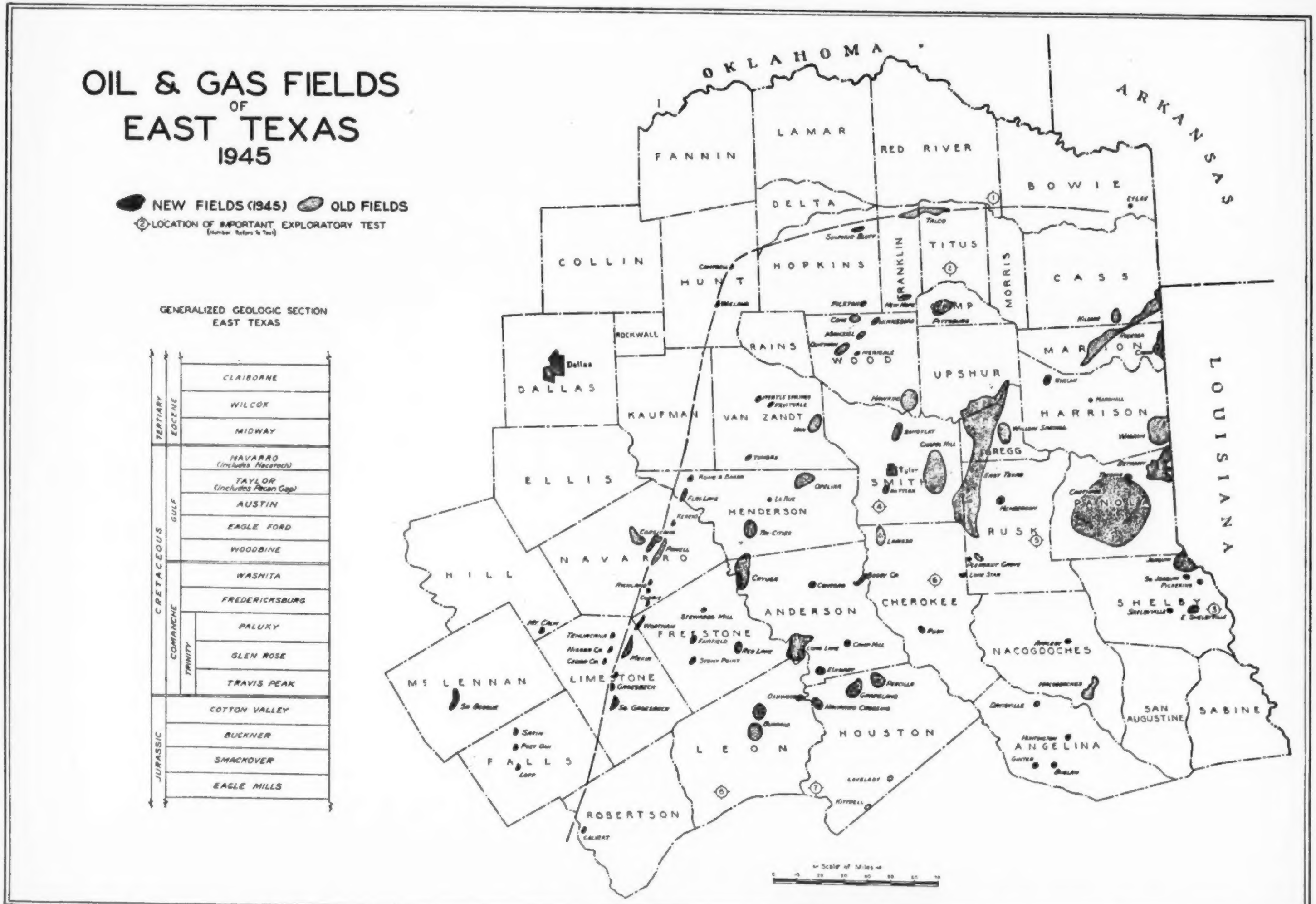
OIL & GAS FIELDS
OF
EAST TEXAS
1945
NEW FIELDS (1945)
OLD FIELDS
LOCATION OF IMPORTANT EXPLORATORY TEST
GENERALIZED GEOLOGIC SECTION
EAST TEXAS
TERTIARY
EOCENE
CRETACEOUS
GULF
COMANCHE
TRINITY
JURASSIC
CLAIBORNE
WILCOX
MIDWAY
NAVARRO (Includes Nacatoch)
TAYLOR (Includes Pecan Gap)
AUSTIN
EAGLE FORD
WOODBINE
WASHITA
FREDERICKSBURG
PALUXY
GLEN ROSE
TRAVIS PEAK
COTTON VALLEY
BUCKNER
SMACKOVER
EAGLE MILLS
OKLAHOMA
ARKANSAS
LOUISIANA
FANNIN
LAMAR
RED RIVER
BOWIE
DELTA
COLLIN
HUNT
HOPKINS
FRANKLIN
TITUS
MORRIS
CASS
DALLAS
Dallas
ROCKWALL
RAINS
WOOD
UPSHUR
MARION
HARRISON
KAUFMAN
VAN ZANDT
SMITH
Tyler
GREGG
ELLIS
HENDERSON
RUSK
PANOLA
NAVARRO
CHEROKEE
HILL
ANDERSON
FREESTONE
SHELBY
NACOGDOCHES
Mc LENNAN
LIMESTONE
LEON
HOUSTON
SAN AUGUSTINE
SABINE
ANGELINA
FALLS
ROBERTSON
Scale of Miles

FIG. 1

TABLE II

DISCOVERIES AND EXTENSIONS IN 1945

County	Field	Operator	Well	Location	Class	Date	Producing Formation	Perforated Interval (Feet)	Initial Production	Discovery Method
Wood	Coke	Amerada	Faulk 3	7¼ mi. W. of Winnsboro	N. fm.	5/19/45	Rodessa	8,080–8,130	1,801 MCF	Sub.
Freestone	Fairfield	Texas	McKnight 1	1 mi. W. of Fairfield	New	2/26/45	Travis Peak	8,232–8,247 8,275–8,297	14,600 MCF	Sub; Seis., Sur.
Freestone	Fairfield	Texas	Sneed 1	1 mi. W. of Fairfield	N. fm.	7/ 3/45	Woodbine	4,198–4,207	27,000 MCF	Sub.
Rusk	Henderson	Danciger	Dorsey 1	5 mi. NW. of Henderson	N. fm.	9/15/45	Travis Peak	7,422–7,428	1,500 MCF	Sub.
Henderson	LaRue	Lone Star	Lee 1	3 mi. N. of Athens	New	1/ 4/45	Rodessa (Bacon)	8,197–8,208	F 262 Oil	Seis.; Sub.,
Cherokee	Lone Star	G. L. Walker	Bowling 1	2¼ mi. W. of New Salem	N. fm.	10/26/45	Navarro	3,299–3,369	P 170 Oil	Sub.
Wood	Manziel	Magnolia	Herring 2-A	4 mi. NE. of Quitman	N. fm.	5/18/45	Travis Peak	8,728–8,743	F 156 Oil	Sub.
Harrison	Marshall	Rogers Lacy	Tuttle 1	3 mi. NW. of Marshall	New	8/15/45	Pettit	6,472–6,480 6,514–6,522	800 MCF	Seis.?
Wood	Quitman	Shell	Atlatl-Harris 1	4 mi. NW. of Quitman	N. fm.	11/15/45	Lower Eagle Ford	4,126–4,140	P 62 Oil	Sub.
Marion	Rodessa	Jefferson Oil & Gas	Whelan 1	2 mi. N. of Jefferson	N. fm. (oil)	10/ 4/45	Travis Peak	7,040–7,050	F 213 Oil	Sub.
Smith	Sand Flat	C. L. Wickliffe	Hackett 1	7 mi. N. of Tyler	Ext.	12/13/45	Paluxy	7,277–7,284	P 135 Oil, 34 SW.	Sub.
Freestone	Stony Point	Texas	Ham 1	7½ mi. SW. of Fairfield	New	9/24/45	Pettit	7,970–7,995 8,002–8,018	13,000 MCF	Seis.; Sub.
Harrison	Whelan	Whelan Bros.	Peal 1	1¾ mi. NW. of Harleton	New	6/27/45	Rodessa (Young)	6,776–6,794	52,000 MCF	Seis.
Harrison	Whelan	Rogers Lacy	Peteet 1	1¾ mi. NW. of Harleton	N. fm.	9/ 7/45	Travis Peak	7,418–7,507	2,000 MCF	Sub.

Under "Class": New, new pool; Ext., extension; N. fm. new producing formation or zone.
Under "Initial Production": P, pumped; F, flowed; MCF, thousand cubic feet gas per day; Oil, barrels per day; SW., salt water barrels per day; Production figures for 24-hour period.
Under "Discovery Method": Seis., Seismograph; Sub., subsurface; Sur., surface.

The increased number of field completions resulted primarily from an intensive drilling campaign throughout the year in the Carthage gas field of Panola County and the resumption of development at Hawkins following the removal of P.A.W. restrictions on September 1, 1945.

During the year five new producing areas were discovered in East Texas as compared with nine new discoveries in 1944.

DISCOVERIES, EXTENSIONS, AND NEW PRODUCING ZONES

All of the five new producing areas discovered in East Texas during 1945 produce from the lower Glen Rose or Travis Peak formations. Fairfield, one of the new gas areas, is also productive from the Woodbine. The discovery wells of new fields, extensions, and new producing zones in older fields are listed in Table II.

NEW FIELDS

Fairfield (Freestone County).—The Fairfield gas and condensate area is about one mile west of the town of Fairfield, in central Freestone County, and 4 miles south of the Steward's Mill Woodbine gas field. The discovery well, The Texas Company's M.A.L. McKnight No. 1, was drilled to the total depth of 8,903 feet, in the Travis Peak formation. It was completed on February 26, 1945, as a gas-condensate well through casing perforations from 8,232 to 8,247 and from 8,275 to 8,297 feet, opposite sands in the upper Travis Peak. Initial production was 14,600,000 cubic feet of gas per day, open flow, together with 30 barrels of 60° gravity condensate. Shut-in tubing pressure was 3,175 pounds. A drill-stem test while the well was drilling indicated gas production from the Woodbine, and non-commercial showings of gas were tested in the Pettit member of the lower Glen Rose.

Later in the year, The Texas Company completed its W. N. Sneed No. 1 as a Woodbine gas well at a location 3,800 feet southwest of the McKnight No. 1, after testing only 500,000 cubic feet of gas per day from the Travis Peak. The Sneed No. 1 was drilled to the total depth of 8,292 feet, plugged back, and completed on July 3, 1945, through casing perforations from 4,198 to 4,207 feet opposite the upper Woodbine. Initial production was 27,000,000 cubic feet of gas per day, open flow, with an estimated 2 barrels of 54° gravity condensate per million cubic feet of gas.

Discovery of the Fairfield gas-producing area is attributed to surface and subsurface geology, supplemented by seismic work. The structure appears to be a low-relief anticline trending northeast-southwest. The gas-water contact in the Woodbine occurs at about 3,800 feet subsea. The water level in the Travis Peak formation has not yet been established. The Texas Company is the controlling operator in the Fairfield area. The wells were shut in at the first of the year because the field has no pipeline outlet.

LaRue (Henderson County).—The LaRue field is about 3 miles north of the town of Athens, in central Henderson County. The discovery well, the Lone Star

Producing Company's R. H. Lee No. 1, reached the total depth of 9,242 feet, in the Travis Peak formation, and was completed on January 4, 1945, through casing perforations from 8,197 to 8,208 feet, opposite a 6-foot porous limestone zone (Bacon limestone) at the top of the Rodessa section. Initial production was 261.74 barrels of 47.6° gravity oil in 24 hours through a $\frac{5}{32}$-inch tubing choke. Tubing pressure was 1,570 pounds, casing pressure 2,500 pounds, and the gas-oil ratio 1,513 cubic feet per barrel.

Before the end of the year, Lone Star's Murchison and Wofford No. 1, located 1,900 feet northwest of the discovery, was drilled to the total depth of 8,911 feet in the Pettit member of the lower Glen Rose. Although it was slightly higher structurally than the discovery, it encountered salt water in the Bacon limestone and was abandoned as a dry hole.

Subsurface geology supplemented by seismic data led to the discovery of the LaRue field, which occurs on an anticline. The general outline had been known for several years from subsurface control afforded by early Woodbine dry holes drilled in this area.

Marshall (Harrison County).—The Marshall field is situated 3 miles north of Marshall, in central Harrison County. The discovery well, Rogers Lacy's J. R. Tuttle *et al.* No. 1, was drilled to the total depth of 7,026 feet, in the upper Travis Peak. It was completed on August 15, 1945, giving an initial production of 800,000 cubic feet of gas and 5 barrels of condensate per day on open flow, through casing perforations from 6,472 to 6,480 and from 6,514 to 6,522 feet, opposite slightly porous limestone zones in the upper Pettit. Shut-in well-head pressure was 2,056 pounds.

A low-relief anticlinal fold as suggested by sparse subsurface control possibly accounts for the gas accumulation in this area.

Stony Point (Freestone County).—The name Stony Point was applied to this new field because of its proximity to Stony Point Church, a small community about $7\frac{1}{2}$ miles southwest of Fairfield, in west-central Freestone County. The discovery well, The Texas Company's Mrs. Nancy Ham No. 1, was drilled to the total depth of 8,541 feet, in the Travis Peak. It was completed on September 24, 1945, yielding an initial production of 13,000,000 cubic feet of gas per day on open-flow test together with an estimated 5 to 8 barrels of 49° gravity condensate per million cubic feet. Casing was perforated from 7,970 to 7,975 and from 8,002 to 8,018 feet, opposite a porous limestone zone in the upper part of the Pettit.

Subsurface geology supplemented by seismic data was responsible for this new discovery, which is believed to be located on a low-relief anticline.

The Texas Company is the principal leaseholder in the Stony Point field. The discovery well was shut in after completion due to the lack of a pipe-line outlet.

Whelan (Harrison County).—The Whelan field is $1\frac{3}{4}$ miles northwest of the town of Harleton, in the northwestern corner of Harrison County. The discovery well, Whelan Brothers' W. N. Peal Estate No. 1, was drilled to the total depth

of 7,864 feet in the Travis Peak formation. It was completed on June 27, 1945, through casing perforations from 6,776 to 6,794 feet, opposite a porous limestone zone in the basal part of the Rodessa member of the lower Glen Rose, which may be correlative with the Young zone of the Rodessa field on the northeast. On open flow, initial production was 52,000,000 cubic feet of gas per day. Condensate production was 10.75 barrels of 58.9° gravity condensate per million cubic feet of gas while flowing through a $\frac{1}{2}$-inch choke. Shut-in casing pressure was 3,125 pounds. This well was later recompleted as a dual gas-condensate producer from the Young and Travis Peak.

Gas production from the Travis Peak formation in the Whelan field was first established by Rogers Lacy's Mrs. E. L. Peteet No. 1, located 4,500 feet northeast of the Peal Estate No. 1. This well was completed on September 7, 1945, as a dual gas-condensate producer from the Young and Travis Peak. Total depth was 7,507 feet in the upper Travis Peak. Initial production from the Young zone was 57,000,000 cubic feet of gas per day on open flow, with an estimated 13 barrels of condensate per million cubic feet, through perforations from 6,830 to 6,842 feet. Initial production from the Travis Peak was 2,000,000 cubic feet of gas per day on open flow, together with 10 barrels of 60.5° gravity condensate per million cubic feet, from open hole between 7,418 and 7,507 feet.

Discovery of the Whelan field is largely the result of seismic work. A broad, low-relief anticline with a minor degree of faulting is indicated. The Placid Oil Company, Whelan Brothers, and Rogers Lacy are the principal operators. The Arkansas-Louisiana Gas Company purchases the gas, which is transported through an 8-inch line to Daingerfield.

FIELD DEVELOPMENTS

Carthage (Panola County).—An active development program continued throughout 1945 in the Carthage gas field of Panola County. In all, 105 wells were completed during the year, of which 71 were dual completions, 31 were single completions, and 3 were dry holes. On January 1, 1946, there were 136 producing wells in the field: 49 single and 87 dual completions. Cumulative gas production to that date was about 82,308,000 MCF.

A tabulation of completions by producing zones follows.

Zone	*Gas Completions*	*Oil Completions*
Rodessa	16	0
Upper Pettit	91	0
Lower Pettit	104	0
Travis Peak	9	3
Total completions	220	3

The Carthage field is one of the major gas fields in Texas, with slightly more than 200,000 acres proved for gas. Most estimates of the ultimate recovery at Carthage range from 4 to 5 trillion cubic feet of gas. On January 1, 1946, the field was served by the United Gas Company's 22-inch line to Houston; the

same company's 24-inch line to Monroe, Louisiana, and the Arkansas-Louisiana Gas Company's $12\frac{1}{2}$-inch line to Bethany. The Lone Star Gas Company was constructing a 14-inch line to connect with its facilities in the Opelika field of Henderson County.

Also at the first of the year three gasoline plants were in process of construction in the field. These include the Chicago Corporation's plant with a daily capacity of 125,000,000 cubic feet of gas, the United Gas Pipe Line Company's plant with a daily capacity of 150,000,000 cubic feet, and the Rogers Lacy plant with a daily capacity of 100,000,000 cubic feet.

Buffalo (*Leon County*).—The principal development during the year in this Woodbine gas field was the drilling of the first deep test in the area. This well, the Shell Oil Company and Lone Star Producing Company's W. L. Tandy No. 1, reached the total depth of 10,807 feet, in the Travis Peak formation. A showing of gas was encountered in the Rodessa section, but a drill-stem test recovered salt water. No showings were observed in the Pettit or Travis Peak, and the well was plugged back and completed as a gas well in the Woodbine.

Chapel Hill (*Smith County*).—In the Chapel Hill field of eastern Smith County, three high-ratio oil wells were completed in the Pettit zone of the lower Glen Rose during 1945. On January 1, 1946, the field contained 69 wells, including 57 oil wells and 12 gas wells. This field produces oil and gas from the Rodessa and Pettit members of the lower Glen Rose and gas-condensate from the Paluxy formation.

A deep test, the Sinclair-Prairie Oil Company's D. D. Shofner No. 1, located in the south-central part of the field, was drilled during the year to a depth of 13,577 feet, penetrating Jurassic sediments believed to be Eagle Mills in age. Gas showings were encountered in the Cotton Valley formation and in a zone believed to be the Smackover limestone. A small amount of high-pressure gas, possibly from the Eagle Mills section, was tested after cementing drill stem which had become stuck at the total depth. At the close of the year, the operators were cutting and pulling stuck drill stem.

Coke (*Wood County*).—During 1945, a deep test was drilled near the center of the Coke field which resulted in the discovery of gas-condensate production from the Rodessa member of the lower Glen Rose. This well, the Amerada Petroleum Corporation's E. L. Faulk No. 3, reached the total depth of 8,376 feet, in the Pettit-Travis Peak transition zone. It was completed on May 19, 1945, through casing perforations from 8,080 to 8,130 feet, opposite a porous Rodessa limestone. Initial production was 102 barrels of 70° gravity condensate and 1,800,795 cubic feet of gas in 24 hours flowing through a $\frac{1}{4}$-inch tubing choke. Cumulative oil production from the Paluxy formation at Coke was about 2,196,000 barrels on January 1, 1946.

East Texas field.—Developments in the East Texas field during 1945 included the completion of 2 oil wells and the abandonment of 703 wells. On January 1, 1946, a total of 3,492 wells had been abandoned, leaving 23,926 wells

producing. Cumulative production to January 1, 1946, was about 2,244,372,000 barrels.

Following is a well-status tabulation at the end of 1945, with comparative figures for wells at the close of 1944.

	1944	*1945*
Flowing	15,530	14,717
Pumping	8,803	8,872
Dead	294	337
Total	24,627	23,926

On January 1, 1946, there were 76 salt-water injection wells in the field, through which 385,000 barrels of salt water were being returned daily to the Woodbine formation.

Hawkins (*Wood County*).—Activity in the Hawkins field during the first 8 months of 1945 was limited to the drilling of four oil wells. With the rescinding of Petroleum Administration for War regulations on September 1, a drilling campaign was inaugurated to complete the 20-acre spacing program originally planned for the field. During the last 4 months of the year 38 oil wells were completed, bringing the total completions for 1945 to 42 oil wells.

On January 1, 1946, there were 443 oil wells in the Hawkins field. Cumulative production was approximately 46,768,000 barrels.

Henderson (*Rusk County*).—Developments during 1945 in the Henderson field of Rusk County included the discovery of gas-condensate in the Travis Peak formation. Oil and gas production had previously been established in the Pettit zone. The discovery well for the Travis Peak formation, the Danciger Oil and Refining Company's C. C. Dorsey No. 1, was drilled to the total depth of 7,590 feet, in the Travis Peak. It was completed on September 15, 1945, through casing perforations from 7,422 to 7,428 feet. Initial production was 1,500,000 cubic feet of gas and 49 barrels of 59° gravity condensate in 24 hours flowing through a $\frac{3}{16}$-inch tubing choke. Tubing pressure was 1,500 pounds.

Five oil wells and three gas wells were completed in the Henderson field during 1945, and at the close of the year the field contained 10 oil wells and 4 gas wells. Cumulative oil production to January 1, 1946, was 243,000 barrels.

Lone Star (*Cherokee County*).—Commercial oil production from the Navarro chalk was established during 1945 in the Lone Star field, which produces from the Woodbine formation. The discovery well, G. L. Walker's P. I. Bowling No. 1, located north of Woodbine production and on the downthrown side of the Woodbine trace of the controlling fault, was originally drilled as a Travis Peak project by W. H. Foster *et al.* to the total depth of 8,370 feet, in the upper Travis Peak. Non-commercial showings of oil and gas were encountered in the Rodessa and Pettit members of the lower Glen Rose. The well was then taken over by G. L. Walker, plugged back to 3,372 feet, and perforated from 3,299 to 3,369 feet, opposite the Navarro chalk section where showings of oil had been noted while

drilling. After shooting with nitroglycerine the well was completed on October 26, 1945, pumping 170 barrels of 41° gravity oil in 24 hours.

The Navarro chalk in the Lone Star area is probably the equivalent of the Nacatoch sand phase developed farther north. It seems to contain little or no effective porosity, and production in the Bowling No. 1 is probably from fractures associated with proximity to faulting.

Two Woodbine oil wells were also drilled in the Lone Star field during 1945, bringing the total of Woodbine producers to five as of January 1, 1946. Cumulative Woodbine production to that date was about 222,000 barrels.

Manziel (Wood County).—Two oil wells were completed in the Manziel field during the year. One of these completions was in the Paluxy, the regular field producing formation, and the other was the discovery well of a new oil-producing zone in the Travis Peak formation. The deep discovery, the Magnolia Petroleum Company's Herring Estate No. 2-A, located on the southwest side of the field, was drilled to the total depth of 8,743 feet, in the Travis Peak. It was completed May 18, 1945, from open hole between 8,728 and 8,743 feet. Initial production was 156 barrels of 44.2° gravity oil in 24 hours flowing through a $\frac{1}{4}$-inch tubing choke. Tubing pressure was 1,100 pounds, and casing pressure was 1,500 pounds. The gas-oil ratio was 2,835 cubic feet per barrel. Three previous penetrations of this section in the Manziel field had found only slight showings of oil in hard sandstone.

Cumulative production from the Manziel field to January 1, 1946, was about 1,151,000 barrels.

Pickton (Hopkins County).—A continuous development program at Pickton in southeastern Hopkins County resulted in the drilling of 15 oil wells and three dry holes during the year. There were 16 producing oil wells in the field on January 1, 1946, and the cumulative oil production on that date was about 355,000 barrels. This field produces from the Bacon limestone zone of the Rodessa.

Quitman (Wood County).—Five oil wells were completed in the Quitman field during 1945, four in the regular field Paluxy "pay" and one in a new producing sand in the lower Eagle Ford formation. The discovery well for the new zone is the Shell Oil Company's Atlatl-Harris No. 1, located in the southwest part of the field. This well found the Paluxy formation on the downthrown side of one of the numerous faults which traverse the structure and failed to encounter porous sand above the water level. It was plugged back and completed on November 15, 1945, through casing perforations from 4,126 to 4,140 feet, opposite a porous sandstone in the lower part of the Eagle Ford. On initial production test the well pumped 62.3 barrels of 23° gravity oil in 24 hours, with 2 per cent salt water.

On January 1, 1946, there were 63 producing wells in the Quitman field, 62 of which were producing from the Paluxy formation. Cumulative production to that date was about 4,880,000 barrels.

Rodessa (Marion and Cass counties).—Two small gas producers were completed in the upper Travis Peak during 1945 in the Jefferson (Marion County)

part of the Rodessa field, and one gas-producing well was completed in the Rodessa member of the lower Glen Rose. A fourth well, the Jefferson Oil and Gas Company's M. J. Whelan Estate No. 1, was completed on October 4, 1945, as the discovery well for Travis Peak oil production in the area. Initial production was 200 barrels of 41.3° gravity oil in 24 hours through a $\frac{1}{8}$-inch choke, with 13 barrels of basic sediment and water. Tubing pressure was 100 pounds, and the casing pressure was 850 pounds. Gas-oil ratio was 630 cubic feet per barrel.

Production is through casing perforations from 7,040 to 7,050 feet, opposite a thin sand in the upper Travis Peak. From the character of the Travis Peak in the several wells which have penetrated this formation, it appears that the sands are thin and lenticular, and the water levels differ in the various sands.

Sand Flat (*Smith County*).—In the Sand Flat field of northern Smith County nine oil wells and two dry holes were completed during the year. On January 1, 1946, the field contained 13 oil wells producing from the Paluxy and one oil well completed in the Rodessa. Cumulative production to that date was approximately 192,000 barrels.

The Paluxy producing area was extended $2\frac{1}{4}$ miles north with the completion on December 13, 1945, of C. L. Wickliffe's Oliver Hackett No. 1 as a commercial oil well. On initial test the well pumped 135 barrels of 23.6° gravity oil and 34 barrels of brackish water in 24 hours through casing perforations from 7,277 to 7,284 feet, opposite porous sand in the upper part of the Paluxy. This well had been temporarily abandoned in 1943 after drilling to the total depth of 9,842 feet, in the Rodessa formation.

SIGNIFICANT WILDCAT WELLS

Jurassic tests.—Eight Jurassic exploratory tests were drilled during 1945 at scattered locations in the East Texas basin, all resulting in dry holes. Six of these wells penetrated the Smackover limestone and two the Cotton Valley formation.

"Tex" Harvey Oil Company's T. H. York No. 1, in the southeast corner of Red River County (No. 1, Fig. 1), found slightly porous oil-stained limestone in the upper part of the Smackover, but was abandoned after swabbing only a small amount of heavy dark brown oil. This well was located on a seismic prospect.

The Humble Oil and Refining Company's C. C. Searcy No. 1, in southern Titus County $1\frac{1}{4}$ miles south of the town of Mt. Pleasant (No. 2, Fig. 1), reached the total depth of 12,012 feet in the Smackover limestone. It found a thick section of 70 feet of porous limestone in the upper Smackover, but no showings were observed. This well is chiefly significant in demonstrating a favorable facies of Smackover limestone in the East Texas basin as far south as Mt. Pleasant.

At the close of the year, the Humble Oil and Refining Company's Pickering Lumber Corporation No. 1 in Shelby County (No. 3, Fig. 1), and the Phillips Petroleum Company's Amelia Englander No. 1 in Smith County (No. 4, Fig. 1) were drilling in the Jurassic at 11,755 and 13,615 feet, respectively. The latter

well is the deepest test drilled in the East Texas district to date. Also in the category of active jurassic tests at the close of the year is the previously discussed Sinclair-Prairie Oil Company's D. D. Shofner No. 1, in the Chapel Hill field of Smith County.

Lower Glen Rose and Travis Peak tests.—There were 30 lower Glen Rose and Travis Peak exploratory wells drilled in various parts of the East Texas basin during 1945. Aside from those which resulted in new discoveries as previously mentioned, perhaps the most interesting test was H. C. Owens' J. H. Rousseau No. 1 in the Pine Hill area of eastern Rusk County (No. 5, Fig. 1). Showings of gas were encountered in the upper Pettit and in the Travis Peak in drilling to the total depth of 7,512 feet, in the upper Travis Peak. Salt water was tested in the Pettit, but on a preliminary test of the Travis Peak through casing perforations from 7,382 to 7,389 feet the well flowed at an estimated rate of 3 to 4 million cubic feet of gas per day, together with a small amount of amber-colored 57° gravity condensate. The well had not been completed on January 1, 1946.

Woodbine tests—T. G. Shaw's J. H. Bolton No. 1, located in eastern Cherokee County (No. 6, Fig. 1) along a fault of the Mt. Enterprise zone on which several Woodbine dry holes have been drilled, was drilled to the total depth of 4,177 feet, in the upper Woodbine. This well encountered showings of oil and gas at the top of the Woodbine, and on a preliminary test swabbed and flowed 15 barrels of fluid in 24 hours, of which 4 barrels was oil and the remainder salt water. The well was incomplete at the end of the year, and it was not known that commercial production could be established.

The impetus given to Woodbine exploration in the southern part of the district in 1944 by the discovery of a thick porous sand section in a well in southwestern Houston County led to the drilling of four Woodbine wildcats in Houston County and three in Leon County during 1945. The two most significant of these wells are discussed in the following paragraphs.

The Woodley Petroleum Company's L. J. Murray *et al.* No. 1, in southwestern Houston County near the community of Creek (No. 7, Fig. 1), was drilled to the total depth of 8,042 feet, in the Woodbine formation. This well, the second Woodbine test in the Creek area, encountered oil stains in water-bearing sands of the upper Woodbine, as did the first well. It was abandoned as dry on April 5, 1945.

Claude Bell's B. W. Brown and J. O. Carson No. 1, in southern Leon County $5\frac{1}{2}$ miles northeast of Normangee (No. 8, Fig. 1), reached the total depth of 7,303 feet in shale, tentatively correlated as upper Woodbine. Oil showings of questionable significance were encountered near the bottom of the hole. At the end of the year preliminary testing operations were in progress.

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DEVELOPMENTS IN UPPER GULF COAST OF TEXAS IN 1945[1]

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ABSTRACT

There was a definite increase in both wildcat and field-well drilling during 1945. Wildcat drilling increased 24 per cent and field-well drilling 25 per cent.

Discoveries increased in number from 17 in 1944 to 26 in 1945. Their average quality is not impressive, and their effect on production rates and reserves will probably be small.

Production decreased 2½ per cent as compared with 1944. This decrease is attributed to the decline in demand following the cessation of hostilities.

Geophysical exploration showed a decline of 8 per cent in crew-weeks below 1944. Geophysics greatest success during the year was in Colorado County where 6 out of 8 wildcats, drilled on seismic prospects, resulted in the discovery of gas-condensate fields.

Most of the new-field wildcats, which resulted in discoveries, were drilled on seismic prospects; however, subsurface studies are credited with 35 per cent of the successes. No zone or trend was neglected in the search for new reserves either by wildcat drilling or geophysical exploration. The deep Frio and Hackberry trend along the coast, the Frio at medium depth in Wharton and Fort Bend counties, the Yegua in the east-central part of the district, the Wilcox across the northern counties, and the flanks of several of the known salt plugs, all received attention. Ten of the 26 discoveries produced from the Wilcox, 10 from the Frio, 5 from the Yegua and 1 from the Miocene. No new trends were opened to exploration. A new objective, the Edwards limestone, may have been added to that part of the downdip Woodbine trend which extends into the extreme northern part of this district.

INTRODUCTION

This is a report on developments in the Upper Gulf Coast of Texas during 1945. This district extends from Matagorda County, Texas, eastward along the Gulf of Mexico to the Louisiana state line. The northern boundary extends from Brazos County, Texas, eastward to Newton County, Texas. The 25 counties included in the district are shown by the map in Figure 1.

Five of the 53 fields in the United States, which have produced 100 million barrels or more of oil, are located in this district. They are Conroe, Humble, Spindletop, Hull, and Hastings, the last two having been added to the list during 1945.

DEVELOPMENT

Drilling activity in the district increased. Wildcat drilling rose to 220 operations in 1945 as compared with 177 in 1944, an increase of 24 per cent. Discoveries also showed a decided increase over the past 2 years being 11 in 1943, 17 in 1944, and 26 in 1945. Field well drilling rose to 563 operations representing an increase of 25 per cent in comparison with 1944, when 422 wells were drilled. This is the greatest number of field wells drilled in any of the four years since the beginning of the war, but is still below the immediate pre-war average. Production decreased

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[2] The Pure Oil Company. The writers wish to acknowledge with thanks, the help of several of their associates in preparing and assembling the material for this paper, and The Pure Oil Company, the Committee on Statistics of Exploratory Drilling, and the *Oil Weekly*, on whom they have drawn heavily for information.

TABLE I

FIELDS DISCOVERED IN UPPER GULF COAST IN 1945

Field Name	County	Operator	Discovery Well	Producing Formation	Producing Depth (Ft.)	Initial Production
1. New Ulm	Austin	Sinclair	W. A. Schweke 1	Wilcox	9,155–65	117 bbls.; 1/4" ck; Gr. 34.6°; R. 1509-1
2. Blue Lake	Brazoria	McCarthy	Ida D. Wilson 1	Frio	8,702–14	Pump. 61 bbls. plus 10% salt water; Gr. 34.8°; R 100-1
3. Double Gum	Chambers	Sun	Moore Est. 1	Frio	8,280–85	41 bbls. plus 41 bbls. salt water; 10/64" ck; Gr. 37.6°; R 800-1
4. South Elm Bayou	Chambers	Texas	J. Connerly 1	Frio	8,397–8,405	30 bbls.; 12/64" ck; Gr. 52.9°; R 66666-1
5. Altair	Colorado	Superior	M. Tait 2-E	Wilcox	8,256–68	432 bbls.; 16/64" ck; Gr. 57.1°; R 3060-1
6. Eagle Lake	Colorado	Stanolind	Unit 1; Stephans Gas 1	Wilcox	9,260–75	147 bbls. plus 0% to 10% salt water; 5/16" ck; Gr. 52°; R 22110-1
7. Hamel	Colorado	Skelly	R. Hamel 1	Wilcox	9,052–69	195 bbls.; 3/16" ck; Gr. 46.3° R 6878-1
8. Inglehart	Colorado	Shell	Kyle Est. 1	Wilcox	8,790–95	62 bbls. plus 8 bbls. brackish water; 1/4" ck; Gr. 50.2; R 50967-1
9. Rock Island	Colorado	Sinclair	Felix Fehrencamp 1	Wilcox	9,678–95	27 bbls.; 1/8" ck; Gr. 50°; R 27919-1
10. West Orange Hill	Colorado	Pan American	R. L. Williams 1	Wilcox	8,368–90	3,156 MCF gas plus small amount of fluid; 17/64" ck.
11. Olive	Hardin	Pan American	Olive Sternenberg Lbr. 1	Wilcox	9,954–10,049	596 bbls.; 7/32" ck; Gr. 44.5°; R 2742-1
12. Addicks	Harris	Texas	M. Hopkins 1	Yegua	7,702–08	4 bbls.; 1/4" ck; Gr. 45°; R 600-1
13. Josey Ranch	Harris	Josey, Inc.	L. M. Josey-Fee 1-A	Yegua	6,955–65	16 bbls.; open flow; Gr. 51.1°; R 1562500-1
14. North Delhi	Harris	Josey-Bruton	D. Rorick 1	Yegua	7,045–55	87 bbls.; 3/8" ck; Gr. 55.5°; R 67429-1
15. Gilbert Ranch	Jefferson	Sun	J. Gilbert Est. 1	Frio	8,676–90	98 bbls.; on regulator; Gr. 61.8; R 35714-1
18. North Cleveland	Liberty	Shell	Grogan Mfg. Co. et al. 1	Yegua	5,782–84	100 bbls.; ¼" ck.; Gr. 40.3°; R 5220–1
17. E. Bay City	Matagorda	Skelly-Stanolind-Tidewater	C. P. Hardy et al. 1	Frio	10,095–117	39 bbls.; 1/4" ck; Gr. 41.5°; R 136291-1
18. So. Call	Newton	Humble	E. C. Hankamer et al. 1	Yegua	7,960–66	80 bbls.; 11/64" ck; Gr. 62; R 14612-1
19. Cold Springs	San Jacinto	Navarro	Foster Lbr. Co. 1	Wilcox	7,905–10	75 bbls.; 3/16" ck; Gr. 38.5° R 12500-1
20. Hyatt	Tyler	Atlantic	American Republic & Houston 1	Wilcox	8,380–82	400 bbls.; 1/4" ck; Gr. 54.9°; R 4850-1
21. Crescent	Wharton	Ferguson & Hutchinson	S. Hamburger 1-A	Frio	4,448–48	750 MCF gas; 1/8" ck
22. Egypt	Wharton	Hudgins-Ferguson-Hudgins	F.B.&D. Duncan 1	Miocene	2,842–46	29,500 MCF gas; Open flow
23. Matzke	Wharton	Texas	H. R. Matzke 1	Frio	5,779–84	48,500 MCF gas; Open flow
24. Menefee	Wharton	Salt Dome	J. Vitera 1	Frio	5,240–44	2,500 MCF Gas; 13/64" ck.
25. No. Hillje	Wharton	Humble	F. T. Rietz 1	Frio	6,744–72	41 bbls.; 1/4" ck; Gr. 61°; R 88780-1
26. So. Hillje	Wharton	S. Harrison	T. N. Mauritz 1	Frio	5,226–32	2 bbls.; 3/16" ck; Gr. 41.8°; R 500000-1

Abbreviations: 1/8" ck., 1/8 inch choke; Gr., gravity; R, gas-oil ratio.


UPPER GULF COAST DISTRICT
OF TEXAS
1945 DISCOVERIES
LEGEND
NEW PRODUCING FIELDS 1945
EXTENSIONS AND NEW SANDS ON OLD DOMES 1945
SCALE IN MILES
TEXAS
LOUISIANA
GULF OF MEXICO
MADISON
TRINITY
BRAZOS
WALKER
POLK
TYLER
JASPER
NEWTON
GRIMES
SAN JACINTO
MONTGOMERY
WASHINGTON
LIBERTY
HARDIN
ORANGE
AUSTIN
WALLER
HARRIS
JEFFERSON
CHAMBERS
COLORADO
FT. BEND
GALVESTON
WHARTON
BRAZORIA
MATAGORDA

FIG. 1

$2\frac{1}{4}$ per cent as compared with 1944. This decrease is attributed to the decline in demand which followed the cessation of hostilities.

NEW FIELDS DISCOVERED

Nine of the 26 new discoveries in 1945 are classed as oil fields, 13 as gas-condensate fields, and 4 as dry gas fields. Of these, 10 are producing from the Wilcox formation and 5 from the Yegua, both of Eocene age; 10 from the *Marginulina*-Frio of Oligocene age; and one from undifferentiated beds of Miocene age. Wharton County led in wildcat drilling with 23 exploratory wells. Wharton and Colorado counties were foremost in the number of discoveries, each having 6 to its credit. Twenty of the 26 discoveries remained one-well fields at the close of the year. The average quality of the new discoveries is not impressive, and their effect on production rates and reserves will probably be small. The new discoveries, with pertinent data, are listed in Table I. Their locations are shown on the map in Figure 1.

Gas-condensate discoveries.—The Altair field of Colorado County and the East Bay City field of Matagorda County were the only two of the 13 new gas-condensate fields in which more than one producing well was completed during the year. The Altair field was discovered by the third and southernmost well drilled on the prospect. This well was completed in the top of the Wilcox at 8,256 feet flowing 432 barrels of 57° gravity condensate through a $\frac{1}{4}$-inch choke with a ratio of 3,060 to 1. The upper 1,000 feet of the Wilcox has been tested and only one productive sand has been located. The field is not expected to exceed 1,000 surface acres; however, the richness of the gas makes this a worthwhile discovery.

Two gas-condensate wells were completed in the East Bay City field and a third was nearing completion at the end of the year. Accumulation was found in the Frio at 10,095 feet. This may develop into a fairly large gas reserve.

None of the other gas-condensate discoveries have been sufficiently developed to permit an accurate evaluation. A number of them appear to be of minor importance. The average depth of the producing zones is 8,500 feet. Six of the discoveries are in sands of the Wilcox, three are in the Yegua, and four in the Frio.

Oil discoveries.—Six of the nine new oil fields were still one-well fields at the close of the year. The Blue Lake field in Brazoria County was more rapidly developed than any of the other discoveries. The producing formation is a thin sand at 8,700 feet, 400 feet in the Frio. Development consisted of 9 producers and 5 dry holes. Some of the dry holes were caused by a shaling-up of the producing sand rather than by an off-structure location. The present proved area covers approximately 200 acres, and will probably be expanded to at least twice this size. Accumulation is on the south side of an up-to-the-coast fault. This is one of the better oil discoveries of the year in this district. Two successful outposts to the Blue Lake discovery have been drilled. One of these was located $1\frac{1}{4}$ miles northeast; the other 2 miles east. Very little information has been released

on these wells. Oil is produced from a Frio sand lower in the section than in the Blue Lake field proper. Although these outpost producers are thought to be located on the same large uplift, they appear to be on separate local closures or fault blocks. Development is active on the eastern extension.

Three high-ratio oil producers were completed in the Cold Springs field of San Jacinto County. This field has now been delimited on the east and west by dry holes. The producing beds are in the upper part of the Wilcox at 7,900 feet. One mile northwest and probably on the same structure accumulation was found in two thin Yegua sands between 4,300 and 4,500 feet. The Wilcox has not been explored in this new area.

At South Hillje, in the extreme southern part of Wharton County, 3 oil wells and one gas well were completed in the top of the Frio. This discovery is confined on the southeast and southwest by dry holes and is not expected to cover a large area.

Although only one well was completed in the Olive field of Hardin County, it deserves mention because it is the deepest relatively low-ratio oil well to be completed in the Wilcox in this district. Completion was in an 18-foot sand in the top of the Wilcox at 9,954 feet. Initial production was 596 barrels of 44.5° gravity oil on a 14/64-inch choke with a ratio of 2,742:1. Accumulation is on the south side of a down-to-the-coast fault. Areal extent of the field is unknown.

In the Hyatt area of Tyler County, one oil well has been completed in a 14-foot sand in the top of the Wilcox at 8,380 feet. The area of the field will probably not exceed 1,000 acres. Accumulation is thought to be on the south side of a down-to-the-coast fault with the critical closure formed by reverse dip into the fault plane.

EXTENSIONS AND NEW SANDS

Routine drilling in partially developed fields, with the resulting extensions, new sands, and new pools, was responsible for the greater part of the new proved reserves. Considerable attention was given to exploring the flanks of known salt domes, the edges of older fields and to prospecting for deeper pays. Successful flank tests opening new pools were drilled on Boling, Big Creek, High Island, Hockley, Nash, Saratoga, and Stratton Ridge domes. From the standpoint of new reserves, the most important extensions appear to be those at the Silsbee field in Hardin County and at the Fannette dome in Jefferson County. The more important extension wells, together with pertinent data, are listed in Table II. The fields or domes in which they are located are shown on the map in Figure 1.

Brazoria County.—A gas-condensate well extended the already large Old Ocean field $\frac{1}{2}$ mile farther east. This field is now nearly 7 miles long and 3 miles wide. A well on the east flank of the Stratton Ridge dome has apparently established commercial production in the Miocene. Previous attempts to find production on the flanks of this large plug during the past 20 years have resulted in only two or three short-lived completions.

TABLE II

IMPORTANT EXTENSIONS AND NEW SANDS IN UPPER GULF COAST OF TEXAS IN 1945

Field Name	*County*	*Operator*	*Well*	*Producing Formation*	*Producing Depth (Ft.)*	*Initial Production*	*Remarks*
Old Ocean	Brazoria	Abercrombie & Magnolia	P. Studer et al. 1	Frio	10,830–850	296 bbls.; 11/64" ck; Gr. 46.5° R 41171-1.	Extended production 1/2 mile east
Stratton Ridge	Brazoria	E. Cockrell	Seaburn Est. 3	Miocene	3,955–66	232 bbls.; 1/4" ck; Gr. 25.4° R 271-1.	NE flank of dome. First commercial production
Cedar Bayou	Chambers	Butcher-Arthur	1st. Natl Bk. of Goose Creek 1	Frio	7,181–83	259 bbls.; 10/64" ck; Gr. 35.5° R 1119-1.	Extended production 1/2 mile southwest. New sand
Chesterville	Colorado	Stanolind	E. Wiese 1	Yegua	6,058–70	26 bbls.; 5/32" ck; Gr. 51.5° R 74675-1.	Extended production 1 mile south. New sand
Columbus	Colorado	Cities Service	J. Schobel 1	Wilcox	7,853–63	124 bbls.; 1/4" ck; Gr. 36.5° R 11000-1.	Extended production 1 mile northeast. New sand
Nash Dome	Ft. Bend	Danciger	T. Meier 1	Frio	5,860–75	269 bbls.; 5/32" ck; Gr. 30.2° R 300-1.	First production on north flank of dome
Hitchcock	Galveston	Stewarts, Inc.	Fee 16	Miocene	6,523–26	163 bbls.; 1/8" ck; Gr. 33.7° R 387-1.	New sand
Saratoga	Hardin	Feldman	S. Bashara 1	Cockfield	6,551–70	395 bbls.; 1/4" ck.; Gr. 34° R 916-1.	New sand
Silsbee	Hardin	American Republic and Houston	Brooks-Fee 33	Yegua	7,510–18	162 bbls.; 5/32" ck; Gr. 41.2° R 2913-1.	New sands
Village Mills	Hardin	American Republic and Houston	Fee-Hardin Co. School Land 2	Cockfield	5,797–5,802	297 bbls.; 3/16" ck; Gr. 37.1° R 522-1.	Extended production to south one mile
Hockley Dome	Harris	Magnolia	Warren Ranch 2	Lime cap	6,356–66	207 bbls.; 11/64" ck; Gr. 32° R 406-1.	First commercial production on dome
Pinehurst	Montgomery	Pan American	L. Posey 1	Wilcox	11,050–86 & 9,565–9,605	228 bbls.; 1/4" ck; Gr. 60.1° R 10118-1 and 72 bbls.; 16/64" ck; Gr. 66.3° R 28458-1.	Two new sands
Coldsprings	San Jacinto	Butcher-Arthur	N. Dobson et al. 1	Yegua	4,374–88 & 4,490–4,502	2371 MCF gas; 1/4" ck and 170 bbls.; 10/64" ck; Gr. 39.6°; R 269-1.	Two new sands
Boling Dome	Wharton	Union of California	Hawes Est. 1	Frio	4,550–70	155 bbls.; 3/16" ck; Gr. 25° R 300-1.	First production on west flank

Chambers County.—Oil production in the Cedar Bayou field was extended ½ mile southwest. Two dry holes and one gas well were drilled following the completion of the extension well in a Frio sand.

Colorado County.—Yegua gas-condensate production was extended one mile south in the Chesterville area. The Columbus gas-condensate field was advanced one mile northeast and high-ratio oil production was established in a new Wilcox sand at 7853. Accumulation of gas-condensate has been found in several other Wilcox sands between 7,800 and 8,900 feet. This area may well develop into a better than average gas-condensate reserve.

Fort Bend County.—On the northwest side of the Big Creek dome, oil was found 3,800 feet beyond the previous flank producing band in a thin sand 350 feet below the top of the Vicksburg. A second producer and a dry hole were completed by the end of the year. The first oil produced on the north flank of the Nash dome was discovered in steeply dipping Frio beds near the edge of the salt.

Galveston County.—Production was extended 900 feet northeast in the Hitchcock field by a completion in a Miocene sand at 6521 approximately 1,400 feet deeper in the section than the established producing beds.

Hardin County.—A new flank producing sand in the Cockfield was found on the north flank of the Saratoga dome. This may stimulate the first active development program on this dome in a number of years. An eastward extension of the Silsbee field, together with deeper drilling, seem to represent the outstanding contribution to new reserves in this district during 1945. The boundaries of the field were expanded by approximately 600 acres. Nine new sands in the middle and lower Yegua were found to be productive of gas or oil. At least 5 of them have an oil zone. The Village Mills field in the northern part of the county, a 1944 discovery, was extended one mile south. The original discovery was a gas-condensate well in the Cockfield. The extension well produced oil from this same formation. Later in the year, gas-condensate production was established in the top of the Wilcox.

Harris County.— What may be classed as the first commercial oil well on the Hockley dome was completed at a location on the west flank. Oil is being produced from limestone cap material in either a second overhang or in the side of the main plug. This well penetrated 1,213 feet of salt from 4,419 to 5,632 feet; emerged into the Cockfield-Yegua zone of the Eocene, and finally went back into a limestone cap at 6,348 feet where oil was produced. Under these conditions, each well must be considered a wildcat. The Hockley dome was discovered in 1906. At least 60 wells, ranging in depth from less than 200 feet to slightly more than 7,000 feet have been drilled since the plug was discovered. A few of these made small producers immediately on completion.

Jefferson County.—Continued drilling on the east flank of the Fannette dome in a highly faulted *Marginulina* and upper Frio section has appreciably increased the oil reserves on this structure.

Montgomery County.—Near Pinehurst, a gas-condensate discovery, which is

probably a 2-mile southwestward extension to the Lake Creek field, found accumulation at 9,564 and 11,050 feet in the upper part of the Wilcox. A second well found oil in two sands not recognized as productive in the first well. This reservoir is thought to be on the south and downdip side of the same strike which influences accumulation at Lake Creek. A considerable gas-condensate reserve is indicated.

Wharton County.—A new flank pool was opened on the west flank of Boling dome. Accumulation, associated with faulting, was found in two Frio sands.

EXPLORATORY METHODS

Most of the new field wildcats in 1945 were drilled on seismic prospects; however, subsurface studies were responsible for 42 per cent of the tests in this classification. One out of 5 new field wildcats was productive. Seismic exploration in this district totaled 1,347 crew-weeks, a decrease of 5.2 per cent from 1944. Gravity exploration totaled 293 crew-weeks, a decrease of 19.3 per cent. The total geophysical crew-weeks amounted to 1,640 for an over-all decrease of 8 per cent over 1944. Geophysical activity was rather evenly distributed over the entire Upper Gulf Coast. The southern part of the *Marginulina*-Frio trend near the coast, partly stimulated by the recognition of the deeper Frio or Hackberry as an additional source of new sand objectives, and the extreme northern edge of the district, encouraged by the finding of Woodbine sand in Madison County, showed a slightly heavier concentration of geophysical efforts.

NEW TRENDS

No new trends were opened to exploration during the year. A new objective the Edwards limestone of the Lower Cretaceous, may have been added to that part of the downdip Woodbine trend which extends into the extreme northern part of this district. Some interest is being shown in the Gulf of Mexico immediately adjacent to the coast. This inshore band will probably receive some attention in the future.

SUMMARY AND CONCLUSIONS

No zone, trend, or type of structure was neglected in the search for new reserves either by deeper drilling, wildcat drilling, or geophysical exploration. The deep Frio and Hackberry trend along the coast, the Frio at medium depth in Wharton and Fort Bend counties, the Yegua in the east-central part of the district, the Wilcox across the northern counties, and the flanks of several of the known salt plugs, all received attention. The number of discoveries showed a decided increase over 1944. Although their average quality is not at present impressive, it is still too early to fully judge the accomplishments of the year.

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DEVELOPMENTS IN LOUISIANA GULF COAST IN 1945[1]

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ABSTRACT

Development in the Louisiana Gulf Coast area in 1945 continued at the rapid pace set in 1944. There were 12 new fields brought in, only one less than last year. Increases were made in field extensions and new sands discovered in old fields. There were 29 extensions, or 47 per cent over 1944, and 38 new sands, or 58 per cent over last year. Geophysical exploration has gone forward at the same high rate as in recent years.

New discoveries continue to be at great depth. Of the twelve new fields, all but one of the discovery wells were below 8,000 feet, nearly half were below 10,000 feet, and one discovered oil at 13,520 feet, the deepest production in the world. These, as during 1944, are predominantly oil rather than gas-distillate fields. No attempt is made to estimate reserves of each, though several are of major size. The total reserve added by new fields, exclusive of additions to existing reserves by extension or new sands, is probably in excess of 48 million barrels.

Wildcat wells were 25 per cent successful, with a total of 67, of which 51 were dry and 16 productive. Twelve of these successful tests are credited with discovering the new fields for 1945, while 4 are more accurately classed as field extensions.

During 1945, 615 wells were drilled, as compared with 492 in 1944, of which 189, or 39 per cent, were dry. There were 107,379,429 barrels of oil produced during the year.

INTRODUCTION

The Louisiana Gulf Coast area includes those parishes of the southern part of the state bounded on the west by Texas, on the south by the Gulf of Mexico, on the east by Mississippi, and on the north in part by Mississippi, and in part by the north line of Pointe Coupé, Avoyelles, Rapides, and Vernon parishes, as indicated on the accompanying map. The parishes of Avoyelles, Rapides, and Vernon have in some years been included in the northern Louisiana district, at other times in the southern Louisiana, and in the 1944 development papers inadvertently in both areas. However, if included in both areas this year, it is of relatively little importance, since they recorded only one minor field discovery.

DEVELOPMENTS

The Louisiana Gulf Coast continued through 1945 to be one of the most active districts in the United States, both in exploration and development. Despite its small size, it was third in new crude reserves discovered, with a total of 162,376,000 barrels, led only by Texas and California. In production it was fourth, led again by Texas and California, and closely following Oklahoma, the third largest producing district. South Louisiana production in 1945 was 107,379,429 barrels, a slight increase over 1944. During the year, the Louisiana

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[2] Consulting geologist and paleontologist. Data used in this paper were obtained from various sources including the *Oil Weekly*, *Oil and Gas Journal*, and several oil companies. In particular the writers wish to thank the Amerada Petroleum Corporation and The Ohio Oil Company for assistance and material freely furnished. The facts submitted are in substantial agreement with those made available by the Committee on Statistics of Exploratory Drilling of the American Association of Petroleum Geologists.

Gulf Coast showed a net increase in reserves of 55,568,000 barrels, being 11 per cent of the total for the nation.

It is interesting to note that while other leading areas increased their reserves principally by extensions to known fields, South Louisiana nosed out California to be second in reserves added by new fields, and leads the nation in new reserves added by the discovery of new pay zones. This is in line with the trend in South Louisiana toward increasingly deeper drilling. During 1945 South Louisiana produced from the world-record depth of 13,520 feet. The average depth of exploratory wells was 10,267 feet, probably the country's deepest average. During 1945, 615 wells were drilled, or an increase of 24 per cent over 1944, which had a total of 492. Of the total, 31 per cent or 189 were dry. Of the 123 exploratory operations, 50 wells, or 41 per cent were successful, an extremely high proportion. Out of 50 rank wildcats, 12 new fields were discovered, or 24 per cent.

TABLE I

LOUISIANA GULF COAST NEW FIELDS IN 1945

Field	*Parish*	*Operator*	*Discovery Well*	*Age*	*Producing from*	*Depth (Feet)*	*Gravity*	*Gas-Oil Ratio*
Bayou Carlin	St. Mary	Humble Oil & Ref. Co.	Miami Corp. 1-H	Miocene	Upper Catahoula	11,598	34.8	387:1
Bayou Perot (Brady)	Jefferson	California Co.	E. P. Brady 1	Miocene	Upper Catahoula	9,897	36.1	908:1
Bon Air (Iowa Junction)	Jefferson Davis	Sohio Petroleum Co.	C. Fontenot 1	Miocene-Oligocene (?)	*Marginulina* zone	9,694	36.9	441:1
Flatwoods	Rapides	La. Land & Exploration	Bentley Tr. 2, A-2	Eocene Wilcox	Lower	6,486	46.8	(?)
Iota	Acadia	Union Sulphur Co.	Medlenka 1	Miocene-Oligocene (?)	Chickasawhay	9,380	31.0	330:1
Mamou	Evangeline	Magnolia Petroleum Co.	Morein 1	Eocene	Upper Wilcox	11,518	46.3	4,000:1
Mud Lake	Cameron	Magnolia Petroleum Co.	Lutcher-Moore A-1	Miocene Oligocene (?)	*Discorbis* zone	10,614	59.5	42,605:1
Oretta	Beauregard	Magnolia Petroleum Co.	Musser-Davis 1	Eocene	Cockfield	8,692	49.7	3,912:1
Pine Grove	Beauregard	Magnolia Petroleum Co.	Lutcher-Moore 1-C	Eocene	Lower Wilcox	11,312	44.0	(?)
Reserve	St. John the Baptist	Atlantic Refining Co.	Lutcher-Moore 1-B	Miocene	*Heterostegina* zone	10,253	43.3	1,335:1
S. Bayou Mallet	Acadia	Union Sulphur Co.	Kahn Estate 1	Miocene-Oligocene (?)	Chickasawhay	9,610	36.6	1,880:1
Weeks Island	Iberia	Shell Petroleum Corp.	Smith-State 1	Miocene	Catahoula	13,505	40.0	18,967:1

NEW FIELDS

The following field descriptions in alphabetical order are not intended to be more than brief summaries of statistics on the discovery wells plus a few notes


N
W
E
S
FLATWOODS
ALEXANDRIA
RAPIDES
PINE GROVE
BEAUREGARD
ORETTA
JEFFERSON
DAVIS
EVANGELINE
MAMOU
SOUTH BAYOU MALLET
IOTA
ACADIA
LAKE CHARLES
BON AIR
LAFAYETTE
BATON ROUGE
RESERVE
ST. JOHN THE BAPTIST
NEW ORLEANS
IBERIA
CAMERON
MUD LAKE
WEEKS ISLAND
ST. MARY
BAYOU CARLIN
HOUMA
BAYOU PEROT
JEFFERSON
GULF OF MEXICO
NEW FIELDS FOR 1945
LOUISIANA GULF COAST
SCALE IN MILES

FIG. 1

of a general character. During 1945 there were 11 new oil fields discovered and one gas-distillate field, of which 8 are of major importance since they contribute a combined reserve of more than 48 million barrels, estimated from preliminary data. All information is summarized in the included Table I.

Bayou Carlin (St. Mary Parish).—The discovery well for this field, the Humble Oil and Refining Company's Miami Corporation 1-H, was completed on July 31, producing 219 barrels per day after drilling to the total depth of 11,919 feet in the Miocene. The reflection seismograph is credited with the discovery; the entire prospective area is under lease by the Humble Oil and Refining Company. The sand perforated is topped at approximately 10,597 feet and is 120 feet thick with only the top 30 feet containing oil. It is doubtful if any of the other sands logged are productive.

Bayou Perot (Jefferson Parish).—This field, also known as *Brady*, was discovered on March 15 by The California Company in E. P. Brady No. 1. It was drilled to the total depth of 11,035 feet, and perforated in 10 feet of oil sand in the top of a 60-foot reservoir topped in the Miocene at 9,896 feet, producing 288 barrels per day. There are at least two other sands which are probably productive, one at 8,400 feet appearing even better than the present producing sand. The structure was discovered by the reflection seismograph, with The California Company the sole lease owner.

Bon Air (Jefferson Davis Parish).—This field is also known as *Iowa Junction*. On December 29, the Sohio Petroleum Company completed Claudius Fontenot No. 1, producing 237 barrels per day of pipe-line oil. The well was drilled to the total depth of 11,000 feet. The producing sand is in the *Marginulina* zone at 9,691 feet. Although the reservoir is thick, only the top 10 or 12 feet contain oil, and it can not yet be considered a major reserve.

Flatwoods (Rapides Parish).—The Louisiana Land and Exploration Company drilled the discovery well, Bentley Trust Tract 2, No. A-2, completing a 44-barrel per day oil well in a thin sand streak topped at 6,486 feet in the lower Sabine Wilcox. The well has been offset by several dry holes, and, since it has shown increasing amounts of salt water, is now shut in. The field should not be considered of major consequence.

Iota (Acadia Parish).—The Union Sulphur Cmpany discovered this field in drilling Medlenka No. 1, completed in January, producing 215 barrels per day. Production from the well has not held up and this is not an important field. The sand was less than 10 feet thick, topped at 9,380 feet in the Chickasawhay of lower Miocene or questionable Oligocene age.

Mamou (Evangeline Parish).—On December 29 the Magnolia Petroleum Company completed J. B. Morein No. 1, producing 210 barrels per day in a 24-foot sand at 11,518 feet in the top of the Sabine Wilcox (Eocene) formation. This well should play an important role in reviving interest in the Wilcox trend. Development may prove this a major reservoir similar to the near-by Ville Platte field. The initial well did not penetrate deep enough to disprove the

presence of other productive sands in the Wilcox. Coring indicated possible distillate production from untested sands in the shallower Sparta zone.

Mud Lake (Cameron Parish).—This field was discovered when the Magnolia completed Lutcher-Moore Lumber Company A-1 on October 18, producing 48 barrels per day of 60° gravity distillate, with high gas-oil ratio. It is the only gas-distillate field discovery for the year, but seems to be of minor importance. Sand development is poor; production is from an isolated sand topped at 10,614 feet in the *Discorbis* zone.

Oretta (Beauregard Parish).—This field is the only new discovery in the Cockfield (Eocene) in 1945. The producing sand was encountered at 8,692 feet and is stratigraphically at the base of the Cockfield, immediately above the Cook Mountain. The discovery well, the Magnolia Petroleum Company's Musser-Davis No. 1, was drilled to the total depth of 9,103 feet and completed on March 9, producing 174 barrels per day.

Pine Grove (Beauregard Parish).—The discovery well for this field was the Magnolia Petroleum Company's Lutcher-Moore Lumber Company 1-C, completed in April as a 4-barrel producer. The sand was topped at 11,312 feet in the middle Wilcox formation. The well has since gone to salt water and this discovery is so far of little importance.

Reserve (St. John the Baptist Parish).—This field was discovered by the Atlantic Refining Company's Lutcher-Moore Lumber Company 1-B when it was completed, producing 265 barrels per day on January 12. The producing sand is a 12-foot body logged at 10,253 feet, just below the *Heterostegina* limestone. The well was drilled to the total depth of 11,514 feet. This structure was discovered by the reflection seismograph as a result of $1\frac{1}{2}$ years of detailing in difficult, swampy terrane. In some summaries the discovery was listed for the end of 1944 instead of early 1945.

South Bayou Mallet (Acadia Parish).—The Union Sulphur Company's Kahn Estate No. 1 discovered this field on April 14. The initial production was 146 barrels per day in a sand topped at 9,610 feet in the Chickasawhay. There may be several additional thin reservoirs just above the present producing zone. The reflection seismograph is credited with the discovery of the structure which is not considered a first-rate oil reserve. Structurally, it appears to be a fault-controlled segment of the Bayou Mallet field.

Weeks Island (Iberia Parish).—This is the most promising discovery of 1945. The Shell Oil Company completed Smith-State Unit No. 1 on May 9, producing 120 barrels per day. The well was drilled to the depth of 14,026 feet with massive productive sands present from 13,100 feet to bottom. The initial completion was made in the base of a thick sand, logged from 13,400 to 13,525 feet. The bottom of the perforated zone was 13,520 feet, which establishes a new world depth record for production. Altogether, there are about five large sands probably productive, with an aggregate net thickness of approximately 550 feet. This field, situated very close to the Gulf, is still in the Miocene at this depth. It is on a

TABLE II

LOUISIANA GULF COAST NEW SANDS AND EXTENSIONS 1945

Field	*Parish*	*Company*	*Well*	*Sand Top (Feet)*	*Type*	*Remarks*
Avery Island	Iberia	Humble Oil & Ref. Co.	Petite Anse 7-B	8,648	Oil	New sand (?)
Avery Island	Iberia	Humble Oil & Ref. Co.	C. G. Hooks 1	11,875	Oil	New sand
Barataria	Jefferson	California Co.	Lester Pailet 1	11,472	Oil	New sand
Barataria	Jefferson	California Co.	Fleming *et al.* 1	11,486	Oil	New sand (?)
Bateman Lake	St. Mary	Texas Co.	Woodward Kepper-Longmire 4	9,948	Gas	4,400 foot south extension
Bateman Lake	St. Mary	Texas Co.	Woodward Kepper-Longmire 3	9,822	Gas-distillate	New sand
Baton Rouge	E. Baton Rouge	Wm. Helis	Nelson, H. B. 15	9,958	Distillate	New sand
Bayou Blue	Iberville	Stanolind Oil & Gas	Wilberts 1	7,120	Oil	New sand
Bayou des Glaise	Iberville	Humble Oil & Ref Co.	Wilberts 6-B	10,354	Oil	New sand
Bayou des Glaise	Iberville	Humble Oil & Ref. Co.	Wilbert Min. 1-C	10,237	Oil	New sand on north flank
Bayou Penchant	Terrebonne	Superior Oil Co.	Continental Land & Fur. 2	10,100	Oil	New sand (?), 2-mile southeast extension
Bayou Perot	Jefferson	California Co.	E. P. Brady 2	9,270	Oil	3,200-foot northeast extension
Bayou Sale	St. Mary	Atlantic Refining Co.	St. Mary Parish Land 15	10,136	Oil	3,000-foot southeast extension
Belle Isle	St. Mary	Sun Oil Co.	Belle Isle Corp. 7	8,252	Oil	New sand on southwest flank
Convent	St. James	McDermott	Realty Operators 6	6,043	Oil	New sand
Delta Duck Club	Plaquemines	Texas Co.	State 8	6,230	Oil	New sand and first salt
Delta Duck Club	Plaquemines	Texas Co.	State 11	8,085	Oil	New sand
Delta Farms	Jefferson	Texas Co.	State Bayou Perot 10	9,400	Oil	3,000-foot east extension
E. Moss Lake Lake	Calcasieu	Continental Oil Co.	Baggett 1	10,426	Distillate	One mile southwest extension
Edgerly	Calcasieu	Gulf Oil	La. Sulphur Mining Co. 1-A	9,330	Oil	New sand (?), 1 mile south extension
Egan	Acadia	Sun & Cities Service	Freeland 1	10,102	Oil	New sand
Egan	Acadia	Irwin & Hudson	Houssiere-Latrielle 1	10,074	Oil	3,000-foot west extension
Fields	Beauregard	Sohio-Yegua	Lutcher-Moore 1-B	8,223	Oil	New sand
Fields	Beauregard	Sohio-Yegua	Lutcher-Moore 3-B	8,508	Oil	New sand
Goodhope	St. Charles	Shell Oil	River and Rails 5	8,182	Oil	New sand and 3,000-foot southwest extension
Horseshoe Bayou	St. Mary	Texas Co.	St. Mary Parish Land 10	9,910	Oil	New sand and 6,000-foot west extension
Jeanerette	St. Mary	Atlantic Refining Co.	Blanchard 1	7,476	Oil	3,000-foot southeast extension
Lake Barre	Terrebonne	Texas Co.	State-Lake Barre 44	11,772	Gas	New sand on northeast flank
Lake Hermitage	Plaquemines	Gulf Oil	Lafourche 15	11,470	Distillate	New sand. Deepest production in field
Lakeside	Cameron	Grubb & Hawkins	Lacassine 1	9,852	Gas	¾ mile southwest extension
LaPlace	St. John the Baptist	Atlantic Refining Co.	Lutcher-Moore 2	9,055	Oil	New sand
Laurel Ridge	Iberville	Humble Oil & Ref. Co.	C. G. Robinson 2	10,600	Gas	One mile northeast extension
Leeville	Lafourche	Texas Co.	La. Land & Exploration Co. 98	8,734	Oil	New sand
Lockport	Calcasieu	Union Sulphur Co.	L. Bordages 1	8,483	Distillate	4,300-foot north extension
Napoleonville	Assumption	Shell Oil	Dugas LeBlanc A-1	6,858	Oil.	New sand on west flank
Neale	Beauregard	Atlantic Refining Co.	Rice-Cooper 1	10,771	Oil	4,000-foot southwest extension
North Cankton	St. Landry	Danciger Oil & Ref. Co.	G. Pothier 1	10,052	Distillate	New sand
North Cankton	St. Landry	Shell Oil	F. A. Broussard 1	10,642	Oil	6,200-foot southeast extension
North Crowley	Acadia	Humble Oil & Ref. Co.	J. B. Stokes 7	4,877	Oil	New sand
North Crowley	Acadia	Humble Oil & Ref. Co.	F. Williams 13	6,611	Oil	New sand
North Crowley	Acadia	Humble Oil & Ref. Co.	F. Williams 14	4,878	Oil	New sand

TABLE II—*Continued*

Field	*Parish*	*Company*	*Well*	*Sand Top (Feet)*	*Type*	*Remarks*
North Jeanerette	St. Mary	Atlantic Refining Co.	Teche Sugar 1	11,875	Oil	New sand
North Ritchie	St. Landry	Hawkins	C. Dischler 1	8,622	Oil	3,000-foot east extension
North Tepetate	Acadia	Atlantic Refining Co.	Fournerat 1-B	8,359	Distillate	7,500-foot west extension
Oretta	Beauregard	Magnolia Petroleum	Musser-Davis 2	8,696	Oil	3,000-foot east extension
Potash	Plaquemines	Humble Oil & Ref. Co.	Orleans Levee Board B-1	10,850	Oil	New sand
Potash	Plaquemines	Humble Oil & Ref. Co.	Orleans Levee Board 89	5,249	Oil	?
Reddell	Evangeline	Continental Oil Co.	Pardee 6	9,712	Distillate	New sand
St. Gabriel	Iberville	Noble & Baker	Caldwell 1	9,192	Oil	One mile south extension
Shuteston	St. Landry	Sun Oil Co.	Burleigh-Miller 2	10,330	Distillate	New sand
Shuteston	St. Landry	Claude Morgan	Dimmick 1	10,368	Distillate	5,700-foot north extension
South Elton	Jefferson Davis	Stanolind Oil & Gas	W. H. Tupper 1	8,064	Oil	New sand (?) and 6,000-foot southwest extension
Thornwell	Cameron	Cities Service	Lacassine 2	9,631	Distillate	3,700-foot southeast extension
Venice	Plaquemines	Tidewater Assoc. Oil	Manhattan Land 1-C	11,867	Oil	New sand on north flank
West Gueydan	Vermilion	Magnolia	F. J. Muller 1	9,288	Distillate	New sand on southeast flank
West Lake Verrett	St. Martin	Shell Oil	Burdin-State 1	4,232	Oil	New sand
West Tepetate	Jefferson Davis	W. T. Burton	Z. Janice 1	8,398	Oil	3,000-foot southwest extension
West White Lake	Vermilion	Union of California	State 1-B	11,800	Oil	New sand

piercement-type salt dome discovered in 1897, but which had not previously produced significant quantities of oil. Chances for shallow production are also considered good, and it should prove to be a major oil accumulation. Of the discoveries for 1945, this is not only the only salt dome in the district, but also the only discovery in which surface or subsurface geology played any important role, the others being attributable mainly to geophysical exploration.

Although the initial well produces with a gas-oil ratio of 18,967 cubic feet of gas per barrel of oil, the oil is of 40° A.P.I. gravity (corrected), and it is considered primarily an oil rather than gas-distillate accumulation.

NEW SANDS AND EXTENSIONS IN OLD FIELDS

There were 38 new productive sands discovered in old fields, or an increase of 58 per cent over 1944. Twenty-two extensions of 3,000 feet or more were made to old fields, or an increase of 47 per cent over the preceding year. New sands and extensions overlap in some places. No individual discussions are attempted here, but all are listed in the accompanying Table II. Their cumulative addition to proved reserves is a large proportion of the total increase.

EXPLORATORY METHODS

It is difficult to obtain usable information from surface geology in the Louisiana Gulf Coast area, where the surface is largely blanketed by Recent and Pleistocene alluvial deposits and the masked objective productive zones are becoming increasingly deep.

The major contribution of surface exploration has been in the locating of

shallow piercement-type domes which were indicated by some surface expression. There have been few near-surface domes discovered in recent years, though new production and new zones are being discovered in proved domes by a combination of geophysical and subsurface research. As a result, exploration has been largely confined to geophysics and wildcat drilling. Reflection-seismograph and gravity exploration was very active throughout the Louisiana Gulf Coast area during 1945, as in previous years. The information at hand indicates that all of the new fields except the Shell Oil Company's discovery on Weeks Island dome can be credited to reflection-seismograph surveys.

It is noteworthy that deep-seated salt was confirmed by drilling in two fields in 1945. The Texas Company's State-Delta Duck Club No. 8 established the presence of salt at 9,758 feet in the Delta Duck Club field in Plaquemines Parish; and the Atlantic Refining Company's Lamoille Bank and Trust Company No. 1 at 10,314 feet on the south flank of the Jeanerette field in St. Mary Parish.

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DEVELOPMENTS IN SOUTH ARKANSAS AND NORTH LOUISIANA IN 1945[1]

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ABSTRACT

A total of 692 wells comprised the drilling operations in South Arkansas and North Louisiana for the year 1945, as compared with 547 in the preceding year and 602 in 1943. Of this total for 1945, 115 dry wildcats were drilled, of which 34 were drilled in South Arkansas and 81 in North Louisiana, as compared with 64 wildcats in South Arkansas and 79 in North Louisiana for 1944.

South Arkansas claimed 3 new oil fields and 3 new producing zones in old fields, while North Louisiana was credited with 7 new oil fields, 4 new gas fields, 1 new distillate field, 4 new oil-producing zones in old fields, 3 new gas-producing zones in old fields, and 1 new distillate-producing zone in old fields. Future drilling might prove several oil pools, which have been given new oil-pool rank, to be extensions of old pools.

The gross oil production of South Arkansas during 1945 amounted to 28,547,400 barrels as compared with 29,312,020 barrels in the preceding year. North Louisiana produced 25,722,270 barrels of oil in 1945 and 26,569,565 barrels in 1944. The area as a whole showed a decline in production of oil of approximately 2.9 per cent.

Subsurface data led to the discovery of more new oil and gas pools than any other method employed, with seismograph a close second.

INTRODUCTION

The area here reviewed is shown in Figure 1. It includes the south part of Arkansas from T. 14 S., to the northern boundary of Louisiana, and North Louisiana from T. 1 N., to the south edge of Arkansas. In the paragraph dealing with the leasing activities of South Arkansas, the writers have included the area slightly north of T. 14 S.

The main object of the paper is to summarize the drilling activity in South Arkansas and North Louisiana for 1945, enumerating the discoveries, new producing zones in old pools, and extensions, with special data on the more important discoveries. Another purpose is to list all important trends, discuss the geophysical activity, and give a brief summary of the main lease plays.

DEVELOPMENT

In all, 692 wells were drilled in this area during 1945, showing an increase of 145 wells over the preceding year. Most of this increase may be attributed to the development of the shallow Delhi oil pool (1944 discovery) in Richland Parish, Louisiana, and the discovery and development of the two oil pools or extensions west of the Delhi pool, West Delhi and Big Creek.

One hundred fifteen dry wildcats were drilled in South Arkansas and North Louisiana during this period, of which 34 were drilled in South Arkansas and 81 in North Louisiana as compared with 64 wildcats in South Arkansas and 79 in North Louisiana for 1944.

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[2] Carter Oil Company.

[3] Atlantic Refining Company.

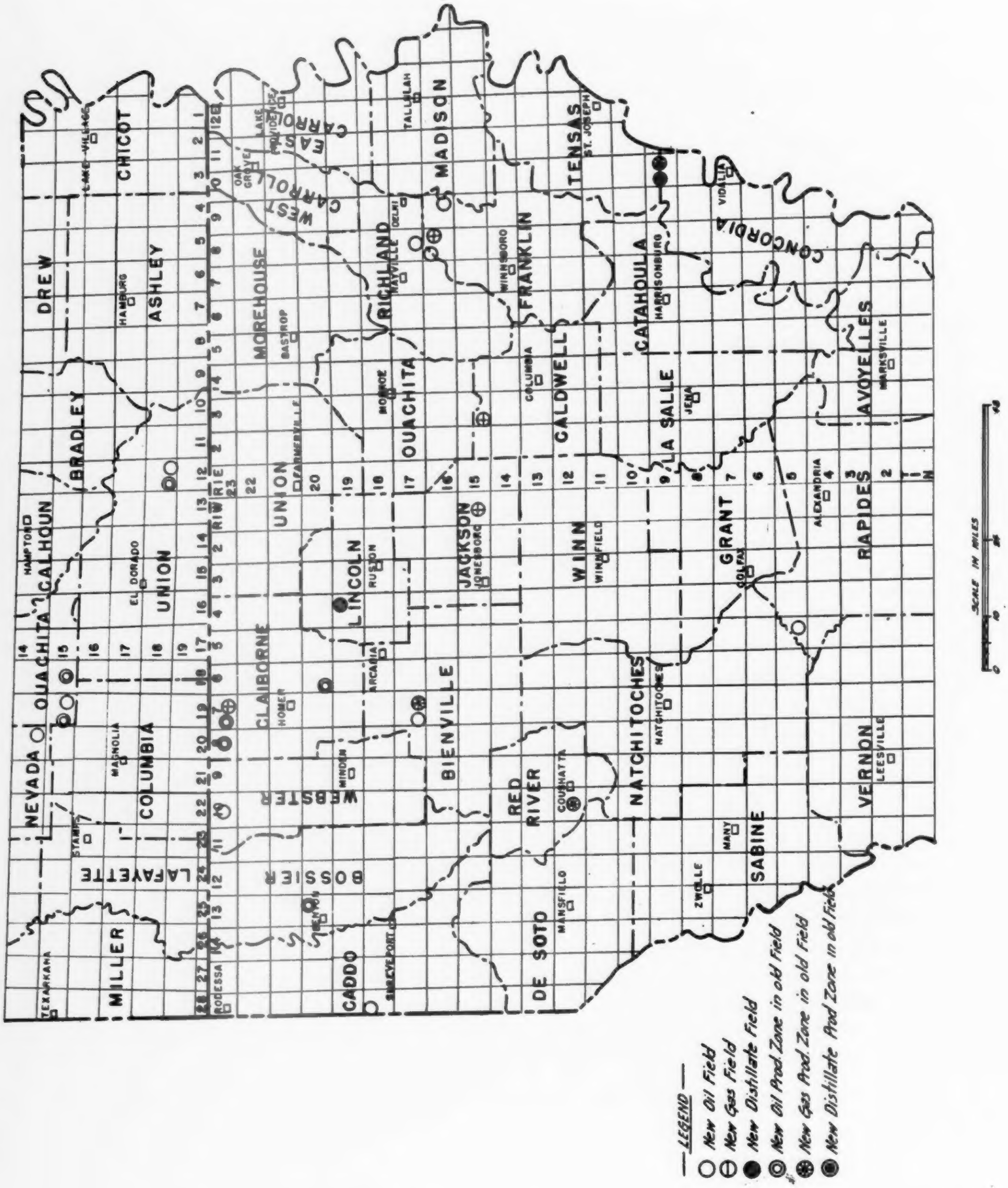

LEGEND
New Oil Field
New Gas Field
New Distillate Field
New Oil Prod. Zone in old Field
New Gas Prod. Zone in old Field
New Distillate Prod. Zone in old Field
SCALE IN MILES
MILLER
LAFAYETTE
COLUMBIA
NEVADA
OUACHITA
CALHOUN
UNION
BRADLEY
DREW
ASHLEY
CHICOT
CADDO
BOSSIER
WEBSTER
CLAIBORNE
LINCOLN
MOREHOUSE
WEST CARROLL
EAST CARROLL
MADISON
RICHLAND
JACKSON
BIENVILLE
DE SOTO
RED RIVER
NATCHITOCHES
WINN
CALDWELL
FRANKLIN
TENSAS
CATAHOULA
LA SALLE
GRANT
SABINE
VERNON
RAPIDES
AVOYELLES
CONCORDIA
TEXARKANA
MAGNOLIA
EL DORADO
HAMPTON
HAMBURG
LAKE VILLAGE
RODESSA
SHREVEPORT
MINDEN
HOMER
ARCADIA
RUSTON
FARMERVILLE
BASTROP
MONROE
DELHI
TALLULAH
OAK GROVE
LAKE PROVIDENCE
JONESBORO
COLUMBIA
WINNSBORO
ST. JOSEPH
VIDALIA
HARRISONBURG
JENA
MARKSVILLE
ALEXANDRIA
COLFAX
WINNFIELD
NATCHITOCHES
COUSHATTA
MANSFIELD
ZWOLLE
MANY
LEESVILLE

FIG. 1

The following tabulation classifies the 1945 discoveries in each state.

State	*New Oil Field*	*New Gas Field*	*New Distillate Field*	*New Oil Prod. Zone in Old Field*	*New Gas Prod. Zone in Old Field*	*New Distillate Prod. Zone in Old Field*
S. Ark.	3			3		
N. La.	7	4	1	4	3	1
Totals	10	4	1	7	3	1

The gross oil production in barrels for 1943, 1944, and 1945 is tabulated here. A decline of 2.9 per cent in production over 1944 was recorded in this area.

State	*1943*	*1944*	*1945*
S. Arkansas	27,495,925	29,312,020	28,547,400
N. Louisiana	30,348,835	26,569,565	25,722,270
Totals	57,844,760	55,881,585	54,269,670

Due to the development of the Delhi pool and the 1945 discoveries west of it, a marked increase in production for North Louisiana should be noted in 1946.

Table I classifies each discovery well and gives in a condensed form important data relative to its discovery.

Table II lists all dry wildcats drilled in South Arkansas and North Louisiana in 1945.

NEW DISCOVERIES

New oil fields.—Three new oil fields were discovered in South Arkansas during 1945. They were North Stephens, Wesson, and Strong. At the end of 1945, North Stephens had six producing wells, Wesson three producing wells, and Strong one producing well. The producing formations are the Ozan in North Stephens, the Glen Rose in Wesson, and the Smackover in Strong. To date none of these discoveries in South Arkansas gives promise of developing into a major oil pool, with the possible exception of Wesson.

North Louisiana claimed seven new oil fields in 1945. These included Sailes, Longwood, Lamar, Flatwoods, Big Creek, West Delhi, and North Shongaloo. At the close of 1945, Sailes had one producing well, Longwood three, Lamar one, Flatwoods none, Big Creek eleven, West Delhi eleven, and North Shongaloo one. Of these new discoveries for North Louisiana, Big Creek and West Delhi are by far the most promising. Future drilling will probably find these two oil pools connected with the Delhi oil pool although the producing sands will be different.

In the Sailes field the oil is in the lower Glen Rose (Pettit limestone), at Longwood in the Hosston, at Lamar in Tuscaloosa, at Flatwoods in the Wilcox, at Big Creek in the Glen Rose and Tuscaloosa, and at West Delhi in the Tuscaloosa and Paluxy.

New gas fields.—No new gas pool was encountered in South Arkansas in 1945, but North Louisiana was credited with four new gas discoveries in that period. These are Vixen, East Haynesville, Southwest Delhi, and Chatham. Gas was discovered in the lower part of the Hosston at Vixen, in the lower Glen Rose

TABLE I

NEW DISCOVERIES FOR SOUTH ARKANSAS

OPERATOR	FARM AND WELL Nº	COUNTY OR PARISH	LOCATION ¼ Sec	LOCATION Sec	LOCATION Twp	LOCATION Rge	DEPTH OF THE PRODUCING ZONE IN FEET
							SOU
J W WARMACH & W C PARTEE	LESTER REALITY CO Nº 1	NEVADA	Cen SE SE NW	36	14S	20W	1990′
R H CROW Tr	J B MORGAN Nº 1	OUACHITA	Cen NW NE NW	18	15S	19W	3088′
Mc ALESTER FUEL CO	CHAS WESSON Nº 1	OUACHITA	Cen NE NE SW	24	15S	19W	2680′
G H VAUGHN	A B TURNER Nº 1	OUACHITA	Cen SE SW NW	22	15S	18W	2480′
BROWN & WHEELER	CARY CLARK Nº 1	UNION	Cen SW SW	22	18S	12W	4817′
ROOT PET CO	UNION SAW MILL Nº 1	UNION	Cen NW NW	27	18S	12W	6330′
							NORTH
OHIO OIL CO	B W CROW Nº 1	BIENVILLE	Cen SW NW	32	17N	7W	7532′
OHIO OIL CO	WOODARD - WALKER Nº 1	BIENVILLE	612′ W x 1962′ N of SE cor	31	17N	7W	6856′
G H VAUGHN	K O PADGETT Nº 1	BOSSIER	Cen SW NE	1	20N	13W	8120′
PHILLIPS PET CO.	MONEYHAM Nº 1	CADDO	Cen NE NW	5	18N	16W	5854′
THE SHELL OIL CO	LA CENTRAL LBR CO Nº 1	CALDWELL	Cen SW SW NW	31	15N	3E	9582′
BLACKWELL OIL CO	WALLER - BEENE Nº A-1	CLAIBORNE	Cen SE SE	10	23N	8W	7985′
HUNT OIL CO	L J BIRDSONG Nº 1	CLAIBORNE	630′ N x 2033′ W of SE cor	15	23N	7W	5172′
HUNT OIL CO	W T OWENS Nº 1	CLAIBORNE	Cen NE SE	15	23N	7W	4128′
THE SKELLY OIL CO	J G DANCE Jr Nº 1	CLAIBORNE	544′ E x 660′ S of NW cor NE SW	31	20N	6W	6038′
AMERICAN LIBERTY OIL CO	KNY Nº 1	FRANKLIN	960′ S x 210′ E of NW cor.	12	16N	8E	3557′
ATLAS OIL REFG CO	BAKER Nº 2	FRANKLIN	Cen. SW SE	27	16N	9E	4874′
SHELL OIL CO	TREMONT Nº 1	JACKSON	Cen. NW SE	22	15N	1W	9584′
THE CALIFORNIA CO	N H NOBLES Nº 1	LINCOLN	676′ x 515′ E of SW cor	12	19N	4W	8700′
LOUISIANA LAND & EXPLORATION CO	BENTLEY TRUST Nº A-2	RAPIDES	700′ x 290′ W of NE cor.	36	5N	5W	6493′
THE TEXAS CO.	RUSS Nº 1	RED RIVER	3300′ S x E of NW cor.	16	12N	10W	5000′
SOUTHPORT PET CO	L S HOWARD Nº 1	RICHLAND	330′ S x E of NW cor	4	16N	8E	2965′
R J CARAWAY	BRYANT Nº 1	RICHLAND	Cen. SE NW	35	17N	8E	3148′
THE CALIFORNIA CO	G C BENNETT Nº 1	TENSAS	Cen of Sec 15 Reg Twp	27	9N	10E	8340′
THE CALIFORNIA CO.	J W BROWN Nº 3	TENSAS	1699′ S x 2967′ E of NW cor SW	46	9N	10E	10,217′
HUNT OIL CO	O G ROBERTS Nº 1	WEBSTER	1980′ S x 1969 E of NW cor.	11	23N	10W	5744′

TABLE I—(*continued*)

AND NORTH LOUISIANA DURING 1945

PRODUCING FORMATION	INITIAL PRODUCTION	DATE COMPLETED	REASON FOR DRILLING	REMARKS	FIELD NAME	NUMBER OF WELLS PRODUCING JAN 1, 1946
TH ARKANSAS						
OZAN (BUCKRANGE SD)	70 B P D (oil)	7 - 14 - 45	SUBSURFACE	DISCOVERY	NORTH STEPHENS	6
LOWER GLEN ROSE (James Lime)	54 B P D (oil)	2 - 22 - 45	POOL WELL	NEW PRODUCTION FORMATION	NORTH WEST STEPHENS	5
LOWER GLEN ROSE	119 B P D (oil)	9 - 7 - 45	SUBSURFACE	DISCOVERY	WESSON	3
TOKIO	60 B P D (oil)	10 - 29 - 45	SUBSURFACE	NEW PRODUCTION FORMATION	GUM CREEK	4
COTTON VALLEY	60 B P D (oil)	10 - 29 - 45	POOL WELL	NEW PRODUCTION FORMATION	STRONG	1
SMACKOVER	100 B P D (oil)	1 - 11 - 45	SEISMOGRAPH	DISCOVERY	STRONG	1
LOUISIANA						
HOSSTON	2,072. MCF – PD	11 - 25 - 45	SUBSURFACE SEISMOGRAPH	NEW PRODUCTION FORMATION	SAILES	1
LOWER GLEN ROSE (Pettit Lime)	192½ B P D (oil)	5 - 27 - 45	SUBSURFACE SEISMOGRAPH	DISCOVERY	SAILES	1
COTTON VALLEY (Bodcow sd)	121 B P D (oil)	12 - 10 - 45	SUBSURFACE	NEW PRODUCTION FORMATION	BENTON	1
HOSSTON	75 B P D (oil)	2 - 16 - 45	SEISMOGRAPH	DISCOVERY	LONGWOOD	3
HOSSTON	5200 MCF PD	5 - 23 - 45	SEISMOGRAPH	DISCOVERY	VIXEN	1
COTTON VALLEY	264 B P D (oil)	6 - 28 - 45	DEEP TEST (in old field)	NEW PRODUCTION FORMATION	HAYNESVILLE	1
LOWER GLEN ROSE (Gloyd Lime)	112 B P D (oil)	10 - 14 - 45	SUBSURFACE SEISMOGRAPH	NEW PRODUCTION FORMATION	EAST HAYNESVILLE	2
LOWER GLEN ROSE (Kilpatrick)	2500 MCF – PD	8 - 18 - 45	SEISMOGRAPH	DISCOVERY	EAST HAYNESVILLE	1
LOWER GLEN ROSE (Pettit Lime)	144 B P D (oil)	11 - 7 - 45	POOL WELL	NEW PRODUCTION FORMATION	ATHENS	1
TUSCALOOSA	2100 M C F – PD	3 - 24 - 45	SUBSURFACE	DISCOVERY	SOUTHWEST DELHI	1
TUSCALOOSA	145 B P D (oil)	12 - 26 - 45	SUBSURFACE	DISCOVERY	LAMAR	1
HOSSTON	8,000 M C F – PD	5 - 17 - 45	SEISMOGRAPH	DISCOVERY	CHATHAM	1 gas well shut in
COTTON VALLEY	145 B P D (DST)	9 - 15 - 45	SEISMOGRAPH	DISCOVERY	KNOWLES	1
WILCOX	50 B P D (oil)	7 - 1 - 45	SEISMOGRAPH	DISCOVERY	FLATWOODS	1
GLEN ROSE	16,600 M C F – PD	2 - 14 - 45	SEISMOGRAPH SUBSURFACE	NEW PRODUCTION FORMATION	GAHAGAN	1
GLEN ROSE	258 B P D (oil)	7 - 17 - 45	SUBSURFACE	DISCOVERY	BIG CREEK	11
PALUXY	198 B P D (oil)	9 - 7 - 45	SUBSURFACE	DISCOVERY	WEST DELHI	11
UPPER TUSCALOOSA	135 B P D (DST)	4 - 3 - 45	POOL WELL	NEW PRODUCTION FORMATION	LAKE ST. JOHN	1
PALUXY	60,000 M C F – PD	8 - 25 - 45	DEEP TEST (in old field)	NEW PRODUCTION FORMATION	LAKE ST. JOHN	2 gas wells shut in
LOWER GLEN ROSE (Pettit Lime)	50 B P D (oil)	6 - 11 - 45	SUBSURFACE SEISMOGRAPH	DISCOVERY	NORTH SHONGALOO	1

TABLE II

WILDCAT DRY HOLES COMPLETED IN SOUTH ARKANSAS & NORTH LOUISIANA, 1945

OPERATOR	FARM	COUNTY OR PARISH	LOCATION SOUTH ARKANSAS CHECK	Sec. - Twp - RGE	TOTAL DEPTH IN FEET	DEEPEST FORMATION PENETRATED	RESULTS	DATE COMPLETED
PLACID OIL CO	CROSSETT Nº 1	ASHLEY	Cen NE SE	34 - 17S - 19W	5515′	SMACKOVER LIMESTONE	DRY & ABD	6 - 18 - 45
CRESLEN OIL CO & R H CROW Tr	NETTLES Nº 1	CALHOUN	Cen NE SW NE	3 - 15S - 14W	2550′	OZAN	DRY & ABD	11 - 14 - 45
R H CROW	STOUT LBR CO Nº 1	CALHOUN	Cen NE NE SW	26 - 14S - 14W	2856′	HOSSTON	DRY & ABD	10 - 1 - 45
J P O'NEIL	GAUGHAN Nº 1	CALHOUN	Cen NW SE NW	22 - 14S - 16W	4510′	SMACKOVER	DRY & ABD	9 - 20 - 45
E E MOORE	V. MOORE EST. Nº 1	CLEVELAND	Cen SW NE	28 - 9S - 10W	4115′	PALEOZOIC (UND)	DRY & ABD	5 - 6 - 45
Mc ALESTER FUEL OIL CO	C B COUCH Nº 1	COLUMBIA	Cen NW SW	11 - 16S - 20W	6793′	SMACKOVER	DRY & ABD	7 - 15 - 45
G H VAUGHN	Mc KISSICH Nº 1	COLUMBIA	Cen SE SE	18 - 16S - 21W	7852′	SMACKOVER	DRY & ABD	4 - 28 - 45
H A WRIGHT et al	W A G WOODARD Nº 1	COLUMBIA	Cen SE NE	6 - 17S - 19W	7502′	SMACKOVER	DRY & ABD	5 - 3 - 45
LISBON GASOLINE CO	THUDIUM Nº 1	CHICOT	2920′ S x 1030′ E of NW cor	9 - 15S - 2W	4614′	IGNEOUS ROCK	DRY & ABD	5 - 12 - 45
W S GOODWIN	S A BANKS Nº 1	DESHA	Cen. NW SE	32 - 9S - 4W	4850′	IGNEOUS ROCK	DRY & ABD	7 - 3 - 45
CURTIS KINARD	T C DEAL Nº 1	DREW	Cen. NW SE	29 - 11S - 7W	4386′	IGNEOUS ROCK	DRY & ABD	4 - 28 - 45
GARLAND ANTHONY et al	A. W. SMITH Nº 1	MILLER	200′ S x 120′ E NW cor SE	24 - 15S - 26W	4034′	RODESSA	DRY & ABD	12 - 12 - 45
ATLANTIC REFG. CO.	MONTANA REALTY CO. Nº 1	MILLER	680′ N x 1980′ W SE cor	17 - 17S - 28W	10006′	IGNEOUS ROCK	DRY & ABD	2 - 20 - 45
BARNSDALL OIL CO	W S NICKOLS et al Nº 1	MILLER	Cen NE NW	20 - 18S - 28W	8457′	COTTON VALLEY	DRY & ABD	10 - 11 - 45
DEEP ROCK OIL CO	Mc CLOUTH Nº 1	MILLER	Cen SE SE SE	26 - 15S - 28W	5120′	HOSSTON	DRY & ABD.	12 - 13 - 45
BIG WEST DRILLING CO.	PAULINE MENDENHALE Nº 1	NEVADA	Cen NW NW NW	1 - 14S - 20W	4795′	SMACKOVER	DRY & ABD	1 - 23 - 45
SKELLY OIL CO	ADAMS Nº 1	OUACHITA	Cen NW NW NW	29 - 13S - 18W	4010′	EAGLE MILLS	DRY & ABD	11 - 29 - 45
BRIZZOLORA & CARNES	DODSON BROS. Nº 1	OUACHITA	100′ N x 240′ W SE cor SW NW	35 - 15S - 19W	3201′	HOSSTON	DRY & ABD.	10 - 10 - 45
JACK CARNES	REYNOLDS & SIFFORD Nº 1	OUACHITA	760′ E x 60′ N SW cor SE SW	8 - 14S - 18W	3051′	SMACKOVER	DRY & ABD	12 - 22 - 45
SOHIO PET CO	S R BLOCK et al Nº 1	OUACHITA	Cen NW NE SW	30 - 14S - 16W	2824′	HOSSTON	DRY & ABD	6 - 19 - 45
G H VAUGHN	E P HALTOM Nº 1	OUACHITA	Cen. NE NE SE	28 - 15S - 18W	6284′	SMACKOVER LIME	DRY & ABD	1 - 31 - 45
O F WHITAKER Tr.	JACK CARNES Nº 1	OUACHITA	Cen. NE NE NE	34 - 13S - 17W	1600′	NACATOCH	DRY & ABD	1 - 3 - 45
ARROW DRLG. CO	U. S. M. Nº A-1.	UNION	Cen SW SW NE	8 - 18S - 12W	2412′	OZAN	DRY & ABD	12 - 1 - 45
R H CROW	RANDOLPH SMITH Nº 1	UNION	Cen. NW NE NE	26 - 18S - 15W	2536′	OZAN	DRY & ABD	1 - 16 - 45
LION OIL REFG. CO	DUMAS Nº 1	UNION	100′ W of Cen NE SW SW	9 - 17S - 16W	6730′	SMACKOVER	DRY & ABD	7 - 20 - 45
KERLYN OIL CO.	CHURCH Nº 1	UNION	Cen. SW SW SE	22 - 19S - 11W	4016′	HOSSTON	DRY & ABD	2 - 2 - 45

TABLE II—(*continued*)

MARINE OIL CO.	L. O. McGOUGH Nº 1	UNION	Cen. NE NW	34 - 17S - 13W	6331'	SMACKOVER	DRY & ABD.	2 - 3 - 45
C. H. MURPHY Jr.	C. H. MURPHY Nº 1	UNION	660' W x 531'S of NE cor	4 - 19S - 15W	7870'	SMACKOVER LIME	DRY & ABD	3 - 19 - 45
NATIONAL ASSOR. PET. CO.	A. SMITH et al Nº 1	UNION	Cen NE NE NE	17 - 16S - 17W	6395'	SMACKOVER	DRY & ABD	1 - 30 - 45
TIDEWATER - SEABOARD	G GRIFFIN Nº 1	UNION	Cen NW SE	33 - 18S - 16W	7919'	SMACKOVER	DRY & ABD	5 - 28 - 45
R. C. WALLINGSFORD	CITIZENS BANK Nº 1	UNION	Cen. NW SE NW	13 - 18S - 13W	2578'	OZAN	DRY & ABD	12 - 1 - 45
R. C. WALLINGSFORD	DUKE Nº 1	UNION	Cen SW NE NW	13 - 18S - 13W	2328'	OZAN	DRY & ABD	12 - 1 - 45
R. C. WALLINGSFORD	UNION SAW MILL Nº 1	UNION	Cen SE NW NW	13 - 18S - 13W	2378'	OZAN	DRY & ABD	12 - 1 - 45
R C WALLINGSFORD	WINEMAN Nº 1	UNION	Cen SW SE SE	13 - 18S - 13W	3050'	HOSSTON	DRY & ABD	11 - 5 - 45
			NORTH LOUISIANA					
CROSBY DRILLING CO et al	SNOWDEN ESTATE Nº 1	AVOYELLES	3705' E & 280'S of NW cor	22 - 3N - 5E	8059'	WILCOX	DRY & ABD	12 - 10 - 45
T L JAMES	SOU ADV BAG & PAPER CO Nº 1	BIENVILLE	872' N 449' W of SE cor NW	23 - 17N - 7W	6335'	PINE ISLAND	DRY & ABD	3 - 20 - 45
J R HAYDEN Tr	ELLERBE Nº 1	BOSSIER	150' N 660' W of SE NE NE	3 - 20N - 13W	9025'	DORIS SAND	DRY & ABD	5 - 25 - 45
UNITED CARBON CO	T G GRAYSON LBR CO Nº 1	CADDO	660' N 1972' W of SE cor	30 - 19N - 15W	6161'	HOSSTON	DRY & ABD	9 - 27 - 45
ALANTIC REFG CO	LA CENTRAL LBR CO Nº C-1	CALDWELL	Cen NE NW NE	14 - 12N - 3E	3855	WILCOX	DRY & ABD	5 - 12 - 45
ATLANTIC REFG CO	TREMONT Nº 1	CALDWELL	881' N 990' E of SW cor	6 - 13N - 2E	6715'	SALT	DRY & ABD	4 - 19 - 45
CRESENT DRILLING CO	LA CENTRAL Nº 1	CALDWELL	660' W 300'S NE NE SE	25 - 13N - 3E	3567'	WILCOX	DRY & ABD	12 - 12 - 45
J F MAGALE	KEELOGG BROS Nº 1	CALDWELL	660' N & E of SE cor of SEC. 40 in SEC. 43	43 - 13N - 4E	6345'	PALUXY	DRY & ABD	11 - 30 - 45
PLACID OIL CO	LA CENTRAL Nº 122	CALDWELL	Cen SE NW	16 - 11N - 3E	7682'	COMANCHE	DRY & ABD.	2 - 9 - 45
STANOLIND OIL & GAS CO.	J M JONES Nº 1	CATAHOULA	Cen SE SE	25 - 10N - 8E	9237'	WASHITA ?	DRY & ABD	1 - 10 - 45
CALIFORNIA CO	H. C. ECKHART Nº 1	CATAHOULA	Cen NE NE	12 - 9N - 7E	9313'	WASHITA ?	DRY & ABD	11 - 20 - 45
BIG WEST DRLG CO	W. D. ALLGOOD Nº 1	CLAIBORNE	Cen SW SW	22 - 22N - 5W	7915'	COTTON VALLEY	DRY & ABD	1 - 5 - 45
F A CALLERY	S E WILLIAMSON Nº 1	CLAIBORNE	Cen SE SE NE	28 - 22N 7W	6225'	HOSSTON	DRY & ABD	6 - 12 - 45
DELTA DRLG CO & M J HOUSTON	E K GLADNEY Nº 1	CLAIBORNE	1980' N 1974' E of SW cor	10 - 21N - 8W	7515'	COTTON VALLEY	DRY & ABD	10 - 11 - 45
H C OWENS et al	T. CRICHTON Nº 1	CLAIBORNE	604' S. 660' E of NW cor NE	1 - 20N - 8W	7019'	HOSSTON	DRY & ABD	11 - 1 - 45
S W RICHARDSON	MADISON OIL & DEVELOPEMENT Nº B-1	CONCORDIA	4240' S x 1716' E of NW cor	16 - 6N - 8E	6559'	WILCOX	DRY & ABD.	12 - 26 - 45
A J BANKHEAD	PORTER Nº 1	DE SOTO	1650' N x 990' E SW cor SE	23 - 12N - 13W	3011'	PALUXY	DRY & ABD	5 - 29 - 45
KERLYN OIL CO	FROST Nº 1	DE SOTO	Cen NE SW	7 - 11N - 12W	6702'	HOSSTON	DRY & ABD.	11 - 3 - 45
E P JARVIS et al	FRANKLIN Nº 1	DE SOTO	Cen. SW SE NW	6 - 11N - 12W	2827'	PALUXY	DRY & ABD.	2 - 8 - 45
E F NEELY & W C FEAZEL	LAFETTE Nº 1	DE SOTO	Cen NW SE	24 - 14N - 12W	1741'	NACATOCH	DRY & ABD	9 - 23 - 45
W I NOWLIN	BOONE Nº 1	DE SOTO	1650' N x 330' W of SE cor.	25 - 11N - 11W	3509'	PALUXY	DRY & ABD.	4 - 13 - 45

TABLE II—(*continued*)

H C OWENS	C L DICKSON Nº 1	DE SOTO	480' S x 2349' W of NE cor	23 - 14N - 13W	2854'	PALUXY	DRY & ABD	4 - 3 - 45
TOM PALMER	W HILL Nº 1	DE SOTO	1980' N x 660' E of SW cor	3 - 10N - 13W	6555'	HOSSTON	DRY & ABD	7 - 26 - 45
H R RANDALL	SIMMONS-FEDERAL LAND BK Nº 1	DE SOTO	1980' S x 660' W of NE cor	36 - 15N - 15W	3312'	PALUXY	DRY & ABD	9 - 25 - 45
G H VAUGHN Jr	Mc GREW Nº 1	DE SOTO	Cen. SW SW	34 - 16N - 14W	9202'	COTTON VALLEY	DRY & ABD	8 - 30 - 45
Mc ALESTER FUEL CO.	P BROWN Nº 1	EAST CARROLL	1980' N & W of SE cor	44 (NORMAL Sec 6) 18N 13E	4208'	RODESSA	DRY & ABD	11 - 6 - 45
Mc ALESTER FUEL CO.	R PETTYFOOT Nº 1	EAST CARROLL	Cen SE NW	11 - 20N - 12E	3020'	GAS ROCK	DRY & ABD	10 - 6 - 45
AMERICAN LIBERTY OIL CO	J. E HOLT Nº 1	FRANKLIN	Cen. NW SE NE	11 - 16N - 8E	3405'	GLEN ROSE	DRY & ABD	1 - 10 - 45
G. L. SMITH	A B MITCHELL EST Nº 1	FRANKLIN	Cen SE SE	28 - 11N - 7E	8082'	PALUXY ?	DRY & ABD	12 - 26 - 45
C L SMITH et al	W R McGEHEE Nº 1	FRANKLIN	Cen SW SW	16 - 11N - 9E	8510'	PALUXY ?	DRY & ABD	11 - 4 - 45
GEORGE W WOODARD	J THOMPSON Nº 1	GRANT	Cen S½ Sec 15	5 - 5N - 3W	1825'	COCKFIELD	DRY & ABD	5 - 30 - 45
THE TEXAS CO.	TREMONT LBR CO Nº 1	JACKSON	Cen. NE NE SW	6 - 16N - 1E	7028'	TRAVIS PEAK	DRY & ABD	3 - 6 - 45
H. L. HUNT	NEBO OIL CO Nº F-128	LA SALLE	3300' W x 660' N of SE cor	36 - 8N - 3E	9350'	PALUXY ?	DRY & ABD	7 - 20 - 45
H L HUNT	NEBO OIL CO Nº F-129	LA SALLE	1980' N x 660' E of SW cor	25 - 8N - 2E	7481'	AUSTIN	DRY & ABD	12 - 8 - 45
BIG WEST DRLG CO	GILL ESTATE Nº 1	LINCOLN	Cen NW SE	35 - 20N - 2W	9950'	COTTON VALLEY	DRY & ABD	2 - 8 - 45
J H WILLIAMS et al	DOWLING ESTATE Nº 1	LINCOLN	536' S x 598' W of NE cor.	29 - 19N - 4W	3500'	TUSCALOOSA	DRY & ABD.	1 - 5 - 45
PRESS COCHRANE	J. M. FRAZIER Nº 1	MADISON	Cen. NE NW	22 - 17N - 10E	3756'	GLEN ROSE	DRY & ABD.	2 - 26 - 45
R L FISHER	L. WESTMORELAND Nº 1	MADISON	Cen. SW NE	27 - 17N - 11E	4416'	PALUXY	DRY & ABD	6 - 16 - 45
Mc ALESTER FUEL CO	SONDHEIMER Nº 1	MADISON	660' N x 1979' W of SE cor	3 - 17N - 12E	4217'	PALUXY	DRY & ABD.	12 - 26 - 45
MURPHY & SUN	H W LEE Nº 1	MADISON	990' N x 430' E of SW cor	8 - 17N - 12E	4603'	PALUXY	DRY & ABD.	11 - 8 - 45
C. H MURPHY Jr & SUN OIL CO.	J. K. MAHONY Nº 1	MADISON	660' N x 2023' E. of SW cor	10 - 17N - 11E	4031'	PALUXY	DRY & ABD.	8 - 4 - 45
V S PARHAM	KATHAN-JOHNSON Nº 1	MADISON	100' S x 25' W of Cen. of NE SE	35 - 18N - 10E	4564'	HOSSTON ?	DRY & ABD	7 - 13 - 45
SINCLAIR PRAIRIE OIL CO	SINGER MFG. CO. Nº 1	MADISON	Cen. SE SE	14 - 15N - 12E	7032'	LOWER CRETACEOUS	DRY & ABD	7 - 1 - 45
SOHIO PET CO	ANDERSON TULLY Nº 1	MADISON	2970' S x 2988' W of NE cor	24 - 16N - 13E	7200'	PALUXY	DRY & ABD	12 - 8 - 45
SOHIO PET. CO.	H. HARPER Nº 1	MADISON	2210' E x 330' N of SW cor.	2 - 16N - 13E	6752'	PALUXY	DRY &, ABD	2 - 16 - 45
SOHIO PET. CO	KATHAN-JOHNSON Nº 1	MADISON	2310' E & S of NW cor.	31 - 18N - 11E	4020'	GLEN ROSE	DRY & ABD.	10 - 20 - 45
SOHIO PET CO & CONTINENTAL CO	W. L. ETHERIDGE Nº 1	MADISON	990' N x 4290' E of SW cor. Sec 14 in Sec 3	3 - 14N - 12E	8024'	WASHITA	DRY & ABD.	11 - 16 - 45
WOODLEY PET. CO	MONTGOMERY Nº 1	MADISON	Cen. NW SE	14 - 15N - 9E	6005'	PALUXY	DRY & ABD.	3 - 24 - 45
THE CALIFORNIA CO.	W. S. LEE Nº 1	NATCHITOCHES	664' S x 1958' E of NW cor.	18 - 13N - 7W	3224'	PALUXY	DRY & ABD.	10 - 26 - 45
THE CALIFORNIA CO.	A. MORRISON et al Nº 1	NATCHITOCHES	Cen. NE NE	12 - 13N - 8W	5323'	RODESSA	DRY & ABD.	2 - 19 - 45
THE CALIF. CO. & SIGNAL OIL CO	NEBO OIL CO Nº 1	NATCHITOCHES	664' S x 1975' W of NE cor.	13 - 13N - 8W	4956'	RODESSA	DRY & ABD.	6 - 16 - 45

TABLE II—(*continued*)

E. H. DEMETRIO	PRUDENTIAL INS. CO. Nº 1	NATCHITOCHES	21' N x 260' W of Cen.	23 - 10N - 9W	1604'	NACATOCH	DRY & ABD.	8 - 16 - 45
E. H. DEMETRIO	PRUDENTIAL INS. CO. 3	NATCHITOCHES	660' S x 330' W of NE cor.	16 - 10N - 9W	750'	MIDWAY	DRY & ABD.	9 - 15 - 45
W C FEAZEL & D. LOE	Mc INTYRE Nº 1	NATCHITOCHES	1638' S x 1636' W of NE cor	12 - 13N - 8W	3334'	TUSCALOOSA	DRY & ABD	3 - 11 - 45
M T HALBOUNTY	J. FOSTER Nº 1	NATCHITOCHES	Cen. SE SE	1 - 13N - 8W	3318'	TUSCALOOSA	DRY & ABD.	10 - 19 - 45
LA. LAND & EXPLORATION CO.	BENTLEY TRUST Nº A-3	RAPIDES	Cen. NW NE	36 - 5N - 5W	7222'	WILCOX	DRY & ABD	4 - 6 - 45
LA LAND & EXPLORATION CO	BENTLEY TRUST Nº A-4	RAPIDES	Cen NW NW	36 - 5N - 5W	7200'	WILCOX	DRY & ABD.	5 - 17 - 45
LA. LAND & EXPLORATION CO.	BENTLEY TRUST Nº 1	RAPIDES	Cen. NW NE	25 - 4N - 5W	2802'	WILCOX	DRY & ABD	7 - 13 - 45
C. W. ROBINSON & H. L WOODS	LONG BELL LBR. CO. Nº 1	RED RIVER	Cen. SW NW	8 - 12N - 8W	6215'	JAMES LIME	DRY & ABD	12 - 19 - 45
THE CARTER OIL CO.	WILLIAM COLBERT Nº 1	RED RIVER	660' S x 560' W of NE cor. NE SE	16 - 13N - 9W	7400'	HOSSTON	DRY & ABD	6 - 27 - 45
GEORGE A STEVENS	L P STEVENS Nº 1	RED RIVER	2310' S x 330' E of NW cor	27 - 12N - 9W	2005'	TOKIO	DRY & ABD	7 - 29 - 45
AMERICAN LIBERTY OIL CO	MENGEL Nº 5	RICHLAND	Cen SE SE SE	19 - 17N - 8E	3343'.	GLEN ROSE	DRY & ABD	12 - 1 - 45
ROESER - PENDLETON et al	TENSAS DELTA Nº 1	RICHLAND	Cen SW SW	1 - 14N - 5E	4510'	PALUXY ?	DRY & ABD	1 - 11 - 45
MILTON HOUSTON & ROGERS LACY	DUCKWORTH ESTATE Nº 1	RICHLAND	430' N x 330' E of Cen.	18 - 17N - 10E	3531'	GLEN ROSE	DRY & ABD.	1 - 11 - 45
HUMPHREY & WYNNE	VALENTINE Nº 1	RICHLAND	Cen S½ SW NE	12 - 15N - 6E	5020'	RODESSA	DRY & ABD	7 - 15 - 45
G C SCHOONMAKER et al	GOLDMINE Nº 1	RICHLAND	330' N x 990' E of SW cor	10 - 14N - 6E	5166'	RODESSA	DRY & ABD	5 - 2 - 45
C W SHARP et al	COCHRAN & FRANKLIN Nº 1	RICHLAND	NW SE	14 - 17N - 8E	3440'	RODESSA	DRY & ABD	1 - 16 - 45
H W TODD et al	GREER ESTATE Nº 1	RICHLAND	440' N x 600' E of NE SW	13 - 16N - 7E	3399'	GLEN ROSE	DRY & ABD	9 - 11 - 45
WARREN PET CO	HEMMLER - SCOTT Nº 1	RICHLAND	Cen NE SE NE	2 - 16N - 7E	3259'	RODESSA	DRY & ABD	10 - 6 - 45
R W WILLIAMS	STONE Nº 1	RICHLAND	660' N x 660' E of SW cor SE	30 - 17N - 7E	7010'	HOSSTON ?	DRY & ABD	6 - 24 - 45
W I NOWLIN	BROWN LBR CO Nº 1	SABINE	1650' S x 1650' E of NW cor	11 - 7N - 10W	3503'	PALUXY	DRY & ABD	5 - 2 - 45
NORTH AMERICAN OIL CONSOLIDATED	WHITNEY CORP Nº 1	SABINE	330' N x 330' E of Cen	5 - 9N - 13W	5812'	RODESSA	DRY & ABD	6 - 14 - 45
PANHANDLE REFG. CO	WHITNEY CORP Nº 1	SABINE	2400' S x 330' W of NE cor	29 - 10N - 14W	6553'	SLIGO	DRY & ABD	5 - 27 - 45
THE CARTER OIL CO	E R BUTTS Nº 1	TENSAS	660' S x 270' W of NE cor NE SW	14 - 10N - 10E	9108'	LOWER CRETACEOUS	DRY & ABD	5 - 1 - 45
CHALMETTE PET CO.	TOWERS Nº 1	TENSAS	Cen NW NE	21 - 11N - 11E	5510'	WILCOX	DRY & ABD	12 - 15 - 45
SHAMROCK OIL & GAS CO	PANOLA CO Nº 1	TENSAS	2320' S x 2372' E of NW cor	34 - 13N - 12E	9240'	PALUXY	DRY & ABD	6 - 30 - 45
ARKANSAS FUEL OIL CO	F BRIGGS Nº 1	W CARROLL	Cen NW NW	9 - 21N - 11E	6937'	EAGLE MILLS (salt)	DRY & ABD	1 - 18 - 45
THE CALIFORNIA CO	J E. HILL Nº 1	W CARROLL	534' N x 635' E of SW cor	2 - 19N - 9E	7337'	SMACKOVER LIME	DRY & ABD	11 - 17 - 45
THE CALIFORNIA CO	HODGE - HUNT LBR CO Nº 1	W CARROLL	Cen SW NW	6 - 19N - 9E	7039'	SMACKOVER LIME	DRY & ABD	7 - 13 - 45
F KIRK JOHNSON	Mc INTOSH Nº 1	W CARROLL	330' N x 393' W of SE cor SE NE	4 - 22N - 10E	5202'	SMACKOVER LIME	DRY & ABD	8 - 11 - 45
J H LILES	HERTZOG Nº 1	NATCHITOCHES	NE SE SEC. 26 REG. TWP	110 - 7N - 6W	3500'	WILCOX	DRY & ABD	8 - 25 - 45

(Kilpatrick) at East Haynesville, in the Tuscaloosa at Southwest Delhi, and in the lower Hosston at Chatham.

At the end of the year, Vixen, East Haynesville, and Southwest Delhi each had one producing well, and Chatham had one well shut in.

New distillate fields.—The Knowles pool in Lincoln Parish, Louisiana, with the producing beds in the Cotton Valley was the only distillate discovery in this area for 1945. This new field claimed only one producing well at the end of 1945.

New oil-producing zones in old fields.—South Arkansas was credited with three new oil-producing zones in old fields. These included Northwest Stephens in the lower Glen Rose (James limestone), Gum Creek in the Tokio, and Strong in the Cotton Valley. At the close of 1945 Northwest Stephens claimed five producing wells, Gum Creek four, and Strong one.

Four new oil-producing zones in old fields were encountered in North Louisiana. They were Benton with oil in the Cotton Valley (Bodcaw sand), Haynesville in the Cotton Valley, East Haynesville in the lower Glen Rose (Gloyd limestone), and Athens in the lower Glen Rose (Pettit limestone). These four new oil-producing zones each had one producing well, with the exception of Athens which had two producing wells at the end of 1945.

New gas-producing zones in old fields.—No new gas-producing zones in old fields were encountered in South Arkansas in 1945, but North Louisiana claimed three: Sailes producing from the Hosston, Gahagan from the Glen Rose, and Lake St. John from the Paluxy. By January 1, 1946, Sailes and Gahagan each had one producing well and Lake St. John had two shut-in wells.

New distillate-producing zones in old fields.—Lake St. John in Tensas Parish, Louisiana, with the producing zone in the upper Tuscaloosa, was the only new distillate-producing zone in an old field discovered in this area in 1945. Only one producing well was recorded at the close of 1945.

IMPORTANT DISCOVERIES

WEST DELHI

The West Delhi oil field is approximately 8 miles southwest of the town of Delhi in Richland Parish, Louisiana.

The discovery well, R. J. Caraway's Bryant No. 1, in the center of the SE. ¼, NW. ¼ of Sec. 35, T. 17 N., R. 8 E., was completed, September 7, 1945, with an initial production of 198 barrels of 40.3° gravity oil per day, through a ⅜-inch tubing choke. The tubing pressure was recorded as 475 pounds, the casing pressure 1,000 pounds, and the gas-oil ratio as 600–1. The completion perforations were from 3,148 to 3,165 feet, opposite a Paluxy sand (Lower Cretaceous age), unconformably below the Tuscaloosa formation of Upper Cretaceous age.

Gas was encountered in the Tuscaloosa immediately below the Gas rock from 3,071 to 3,084 feet. Also in the Tuscaloosa, oil was noted from 3,113 to 3,127 feet. No production tests were made in these Tuscaloosa gas and oil sands. The well was still in the Paluxy as its total depth of 3,302 (–3,215) feet.

It is believed that the producing zone in the Paluxy encountered in the discovery well of Delhi is higher stratigraphically than the producing sand in Caraway's Bryant No. 1. This belief is based on a limestone containing gastropods found in both West Delhi and Delhi. An interval of approximately 375 feet was noted from the base of the Paluxy producing zone (Holt sand) to the base of the gastropod limestone in Delhi field as compared with an interval of approximately 200 feet from the base of the Paluxy producing zone (Bryant sand) to the base of the gastropod limestone in West Delhi.

Producing wells in the Delhi and West Delhi pools were separated at the end of the year by less than one mile. Indications were that future drilling would prove the two to be one pool.

The field is located structurally on the south flank of the Monroe uplift. The Monroe gas rock of Upper Cretaceous age is found overlapping the Tuscaloosa in the southern part and the Comanche in the extreme northern part.

The oil accumulation is probably the result of a stratigraphic trap. Evidently there were two major uplifts, one occurring at the close of Lower Cretaceous time and the other at post-Tuscaloosa and pre-Gas rock time. After the uplift at the close of Lower Cretaceous, the raised formations underwent a period of truncation, exposing progressively older sedimentary rocks from Delhi to West Delhi.

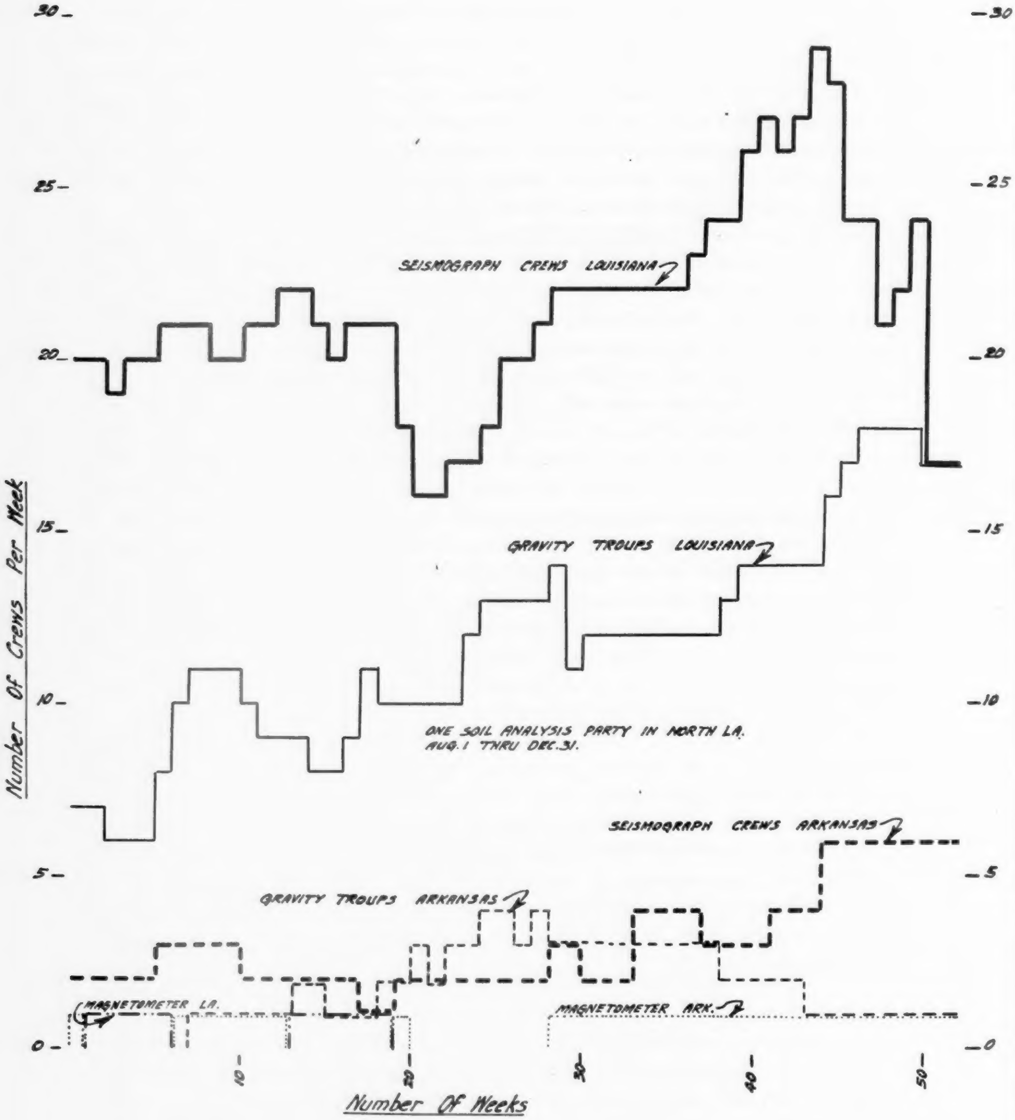
Following this period of truncation, the Tuscaloosa material was deposited on this old erosional surface, the older sediments probably being laid down at Delhi, the younger sediments overlapping in a westward direction. Therefore, the Tuscaloosa material resting on the Comanche in the Delhi field is believed to be older than the sediments on the Comanche in West Delhi. After the Tuscaloosa and possibly even younger sediments were deposited, the area was again uplifted and subjected to truncation.

It is believed that the producing sand (Holt sand) in the discovery well at Delhi is Paluxy in age, and the producing sand (Bryant sand) in the discovery well at West Delhi is also Paluxy in age, but is older than the Holt sand and rests directly on rocks supposedly Glen Rose in age. The Holt sand is missing in West Delhi by truncation. The Bryant sand contains salt water in the Delhi field.

The Tuscaloosa contains oil saturation in West Delhi and gives promise of being very productive. The oil-bearing sands in this formation are thought to be younger in age than the basal producing sand (Barrier sand) of the Tuscaloosa in the Delhi field.

BIG CREEK

The discovery well of the Big Creek pool was the Southport Petroleum Company's L. S. Howard No. 1, 330 feet south and east of the NW. corner of Sec. 4, T. 16 N., R. 8 E., Richland Parish, Louisiana. It was completed July 17, 1945, flowing 258 barrels of 40.6° gravity oil per day with perforations from 2,965 to 2,980 feet. The producing sand was considered to be in the upper Glen Rose formation.



MAP SHOWING GEOPHYSICAL ACTIVITIES PER CREW-WEEK IN NORTH LOUISIANA AND SOUTH ARKANSAS FOR YEAR 1945.

FIG. 2

The structure and geological history are believed to be similar to those of the West Delhi pool, previously discussed.

As in West Delhi, the Tuscaloosa oil sand encountered in Big Creek is considered younger than the Barrier sand (Tuscaloosa) which is found resting on the Paluxy at Delhi.

At Big Creek, sedimentary rocks of the Tuscaloosa are found overlying the Glen Rose; at Delhi and West Delhi the Tuscaloosa rests on the Paluxy.

The Big Creek field is less than 2 miles southwest of the West Delhi field. Future drilling may prove a connection between these two fields.

GEOPHYSICAL DATA

Geophysical activity in this area in 1945 is graphically shown in Figure 2. As in 1943 and 1944, reflection-seismograph work led other geophysical methods in both states, with gravity and magnetometer following in importance. One soil-analysis party worked in North Louisiana from August 1 through December 31.

EXPLORATORY METHODS RESULTING IN NEW DISCOVERIES

The exploratory methods responsible for the 26 new discoveries in South Arkansas and North Louisiana in 1945 are enumerated in the following tabulation. Subsurface and seismograph led other methods in locating these new oil, gas, and distillate pools. Some of the areas which are claimed as seismograph discoveries were first mapped with gravity-meter and later confirmed with seismograph.

New Discovery Methods

	Seismograph	*Seismograph and Subsurface*	*Subsurface*	*Pool Well*	*Deep Test in Old Field*
Number of New Discoveries	7	5	8	4	2

LEASING ACTIVITY

Acres Acquired

	1943	*1944*	*1945*
S. Arkansas	710,488	857,917	954,857
N. Louisiana	1,431,236	1,959,806	2,894,770

The tabulation of acres acquired shows the leasing activity in South Arkansas and North Louisiana during the years 1943, 1944, and 1945. The increase in South Arkansas during 1945 over 1944 can be attributed to the stratigraphic trap possibilities in Desha, Drew, Chicot, and Lincoln counties, and the increase of almost one million acres in North Louisiana was caused by the concentration of interest on the Tuscaloosa-Paluxy trend in the northeastern part of the state.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6 (JUNE, 1946), PP. 1020-1050, 1 FIG.

DEVELOPMENTS IN SOUTHEASTERN STATES IN 1945[1]

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ABSTRACT

Despite a low discovery ratio, the southeastern states have completed a year in which all phases of development and exploration have maintained or increased the activity of previous years.

Alabama had a total of 21 wildcats drilled, of which 20 were abandoned and 1 was completed as a gas well of doubtful commercial significance.

Fourteen producers and 4 dry holes were completed in the Gilbertown field, Choctaw County, Alabama. Production from Gilbertown was 186,817 barrels of oil in 1945, as compared with 56,064 barrels in 1944.

Geophysical work in Alabama in 1945 was 1,099 crew weeks, or 265 crew weeks more than during the previous year.

Florida had 14 wildcats drilled and abandoned during the year, while one producer and one dry hole were added in the Sunniland field, Collier County. Production from 2 wells in Sunniland was 27,618 barrels; in 1944 it was 11,832 barrels from 1 well.

A total of 1,416 crew weeks of core-drill and geophysical work was accomplished in Florida during 1945, as compared with 1,397 crew weeks in 1944.

Five wildcats were drilled in Georgia in 1945 and all were dry. Geophysical work in 1945 totalled 215 crew weeks, or only 6 weeks more than in 1944.

In Mississippi there were 117 wildcat wells drilled which discovered 5 new fields and 3 salt domes. A total of 234 wells were drilled in established producing areas, adding 190 producers and 44 dry holes. Eleven sulphur tests were drilled.

In 1944 there were 72 wildcats (5 productive, 67 dry), 129 field wells (113 productive, 16 dry), and 51 sulphur tests.

All Mississippi fields produced a total of 19,005,971 barrels of oil and condensate in 1945. Production in 1944 was 16,420,346 barrels.

Geophysical and core-drill activity increased from 3,090 crew weeks work in 1944 to 4,209 crew weeks in 1945.

INTRODUCTION

The southeastern district, as in previous years includes Alabama, Florida, Georgia, and Mississippi.

Data for each of the four states are presented separately and highlights of development in drilling, production, and geophysical exploration are summarized.

Figure 1 is an index map of Mississippi and western Alabama. Each of the new fields and salt domes is indicated on the map, accompanied by the name selected by the nomenclature committee of the Mississippi Geological Society.

The producing areas and domes discovered prior to 1945 are numbered as follows.

1. AMORY FIELD, Monroe County, Mississippi—discovered October 6, 1926. Produced gas (now depleted) from the Hartzelle sandstone of Mississippian age.
2. FAYETTE FIELD, Fayette County, Alabama—discovered 1909. Produced gas (now depleted) from Fayette sandstone of Pennsylvanian age.
3. CARY FIELD, Sharkey County, Mississippi—discovered September 16, 1941. Produces 25° API gravity oil from Selma "Gas rock," Cretaceous. 2 wells producing.
4. TINSLEY FIELD, Yazoo County, Mississippi—discovered September 5, 1939. Produces 34° to 46° API gravity oil from Selma "Woodruff" sand, and various sands in Eutaw and Tuscaloosa. First commercial oil production in Mississippi and still largest proved reserve. 304 wells producing.

[1] Manuscript received, April 3, 1946. Read by title before the Association at Chicago April 2-4, 1946.

[2] Consulting geologist, Dixie Geological Service.

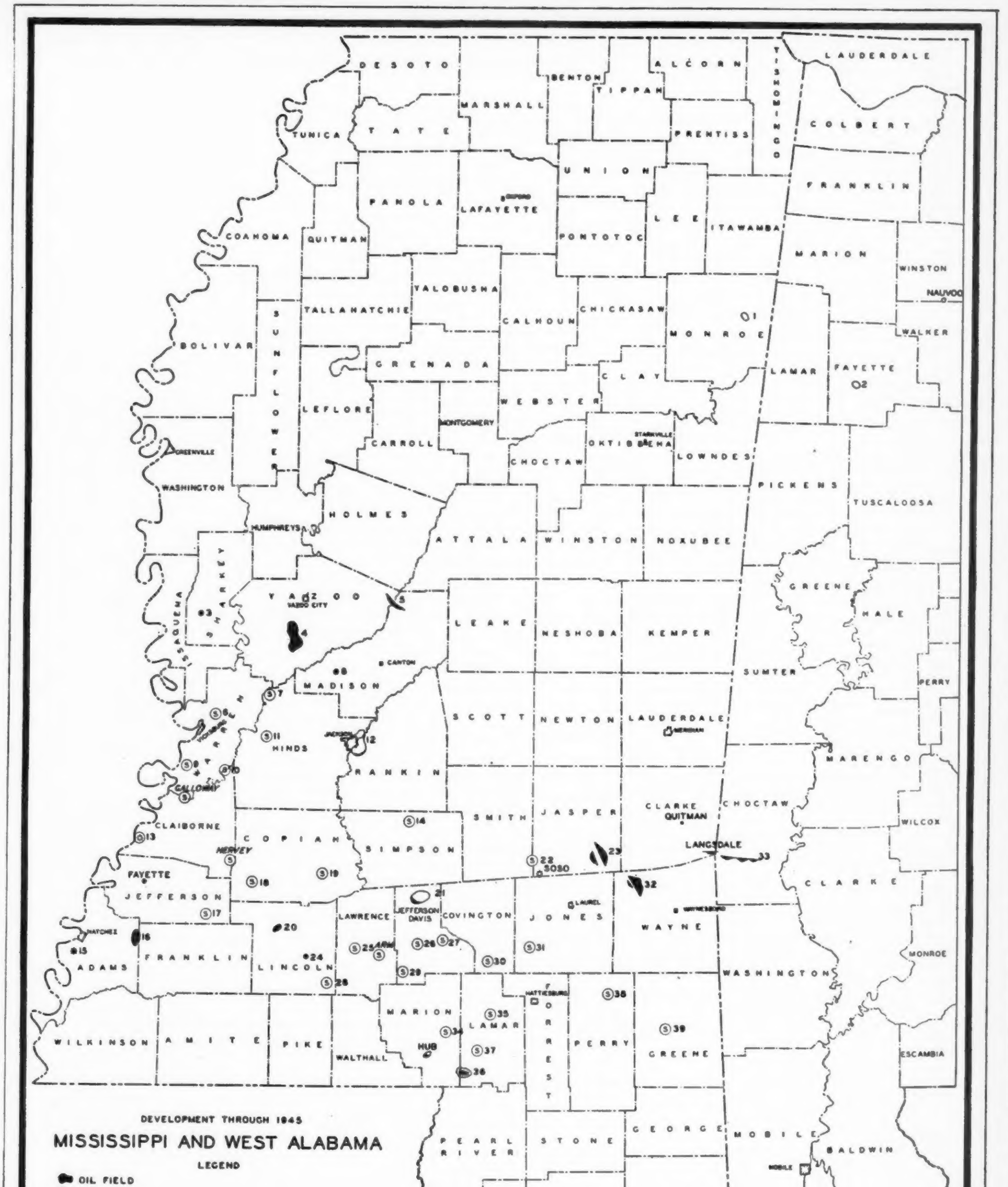
DEVELOPMENT THROUGH 1945
MISSISSIPPI AND WEST ALABAMA
LEGEND
OIL FIELD
GAS FIELD
SALT DOME
SEE TEXT FOR NUMERICAL INDEX TO FIELDS AND DOMES DISCOVERED PRIOR TO 1945
SCALE: 0 10 20 30 40 50
MILES
DESOTO
BENTON
ALCORN
TISHOMINGO
LAUDERDALE
TIPPAH
MARSHALL
TUNICA
TATE
PRENTISS
COLBERT
UNION
FRANKLIN
PANOLA
LAFAYETTE
OXFORD
LEE
ITAWAMBA
COAHOMA
QUITMAN
PONTOTOC
MARION
WINSTON
NAUVOO
YALOBUSHA
TALLAHATCHIE
CALHOUN
CHICKASAW
MONROE
WALKER
SUNFLOWER
BOLIVAR
GRENADA
CLAY
LAMAR
FAYETTE
LEFLORE
WEBSTER
MONTGOMERY
STARKVILLE
CARROLL
OKTIBBEHA
LOWNDES
GREENVILLE
CHOCTAW
WASHINGTON
PICKENS
TUSCALOOSA
HOLMES
HUMPHREYS
ATTALA
WINSTON
NOXUBEE
SHARKEY
ISSAQUENA
YAZOO
YAZOO CITY
GREENE
HALE
LEAKE
NESHOBA
KEMPER
MADISON
CANTON
SUMTER
PERRY
WARREN
HINDS
JACKSON
SCOTT
NEWTON
LAUDERDALE
MERIDIAN
MARENGO
CALLOWAY
RANKIN
CLAIBORNE
COPIAH
SIMPSON
SMITH
JASPER
CLARKE
QUITMAN
CHOCTAW
WILCOX
HERVEY
LANGSDALE
SOSO
FAYETTE
JEFFERSON
JEFFERSON DAVIS
LAWRENCE
COVINGTON
JONES
LAUREL
WAYNE
WAYNESBORO
CLARKE
NATCHEZ
ADAMS
FRANKLIN
LINCOLN
ARM
WASHINGTON
MONROE
HATTIESBURG
FORREST
MARION
LAMAR
PERRY
GREENE
WILKINSON
AMITE
PIKE
WALTHALL
HUB
ESCAMBIA
PEARL RIVER
STONE
GEORGE
MOBILE
BALDWIN
HARRISON
JACKSON
HANCOCK
GULFPORT
PASCAGOULA

FIG. 1

5. PICKENS FIELD, Madison and Yazoo counties, Mississippi—discovered April 9, 1940. Produces 40° API gravity oil from Eutaw "Wilburn" sand. 43 wells producing.
6. KINGS DOME, Warren County, Mississippi—discovered November 21, 1941.
7. HALIFAX DOME, Hinds County, Mississippi—discovered January 21, 1941.
8. FLORA FIELD, Madison County, Mississippi—discovered September 8, 1943. Produces 26° API gravity oil from Selma "Gas rock." 3 wells producing.
9. GLASS DOME, Warren County, Mississippi—discovered April 2, 1940.
10. NEWMAN DOME, Warren County, Mississippi—discovered November 23, 1940.
11. EDWARDS DOME, Hinds County, Mississippi—discovered December 5, 1937.
12. JACKSON FIELD, Hinds and Rankin counties, Mississippi—discovered February 28, 1930. Produces dry gas from Selma "Gas rock"; has produced small amount of 14° API gravity oil on south flank. 16 gas wells producing.
13. BRUINSBURG DOME AND FIELD, Claiborne County, Mississippi—DOME discovered March 10, 1944. FIELD discovered November 22, 1944. Produces dry gas from Cockfield formation. 1 well producing.
14. D'LO DOME, Simpson County, Mississippi—discovered September 6, 1942.
15. CARTHAGE POINT FIELD, Adams County, Mississippi—discovered February 13, 1943. Produces gas and 54° API gravity condensate from basal Tuscaloosa "Massive" sand. 1 well producing.
16. CRANFIELD FIELD, Adams County, Mississippi—discovered October 6, 1943. Produces 39° API gravity oil from "Massive" sand on the rim of the structure; produces 53° API gravity condensate and gas from the "Massive" sand on top of structure; produces 40° API gravity oil from Wilcox sand. 10 Wilcox wells producing, 33 "Massive" sand wells producing.
17. LEEDO DOME, Jefferson County, Mississippi—discovered June 29, 1943.
18. ALLEN DOME, Copiah County, Mississippi—discovered March 15, 1944.
19. SARDIS CHURCH DOME, Copiah County, Mississippi—discovered May 14, 1943.
20. BROOKHAVEN FIELD, Lincoln County, Mississippi—discovered July 8, 1943. Produces 25° to 36° API gravity oil from basal Tuscaloosa stringer sands and "Massive" sand. 2 wells producing.
21. GWINVILLE FIELD, Jefferson Davis County, Mississippi—discovered August 11, 1944. Produces 50° to 54° API gravity condensate and gas from basal Eutaw and upper Tuscaloosa; produces 41° API gravity oil from upper Tuscaloosa; produces 41° API gravity oil from basal Tuscaloosa stringer sand above "Massive" sand. 11 wells producing or producible.
22. NEW HOME DOME, Smith County, Mississippi—discovered August 4, 1943.
23. HEIDELBERG FIELD, Jasper County, Mississippi—discovered January 30, 1944. Produces 22° to 32° API gravity oil from Eutaw, Tuscaloosa and "Massive" sand (1 well). 104 wells producing.
24. MALLALIEU FIELD, Lincoln County, Mississippi—discovered August 24, 1944. Produces 38° API gravity oil from basal Tuscaloosa "Massive" sand. 2 wells producing.
25. MONTICELLO DOME, Lawrence County, Mississippi—discovered September 25, 1943.
26. PRENTISS DOME, Jefferson Davis County, Mississippi—discovered August 8, 1943.
27. CARSON DOME, Jefferson Davis County, Mississippi—discovered September 4, 1943.
28. RUTH DOME, Lincoln County, Mississippi—discovered July 28, 1942.
29. OAKVALE DOME, Jefferson Davis County, Mississippi—discovered November 12, 1940.
30. RICHMOND DOME, Covington County, Mississippi—discovered November 24, 1944.
31. MOSELLE DOME, Jones County, Mississippi—discovered November 6, 1943.
32. EUCUTTA FIELD, Wayne County, Mississippi—discovered October 7, 1943. Produces 20° to 32° API gravity oil from Eutaw (1 well produced from upper Tuscaloosa and 1 from "Massive" sand, both abandoned). 84 wells producing.
33. GILBERTOWN FIELD, Choctaw County, Alabama—discovered February 16, 1944. Produces 19° API gravity oil from fractured Selma chalk and Eutaw. 24 wells producing.
34. LAMPTON DOME, Marion County, Mississippi—discovered June 25, 1943.
35. MIDWAY DOME, Lamar County, Mississippi—discovered January 12, 1937. First drilled salt dome in Mississippi.
36. BAXTERVILLE FIELD, Lamar and Marion counties, Mississippi—discovered November 18, 1944. Produces 14.5° to 17.5° API gravity oil from "Massive" sand and 50° to 55° API gravity condensate from upper Tuscaloosa. 13 wells producing or producible.
37. TATUM DOME, Lamar County, Mississippi—discovered October 21, 1940.
38. RICHTON DOME, Perry County, Mississippi—discovered October 15, 1944.
39. BYRD DOME, Greene County, Mississippi—discovered July 21, 1943.

ALABAMA

Wildcat drilling activity in Alabama during 1945 duplicated the record for the previous year when a total of 21 wells were drilled, resulting in a single discovery.

In Winston County, Glen D. Rose drilled Z. A. Bozhell No. 1 in Sec. 18, T. 12 S., R. 8 W., and completed the well at total depth of 2,005 as a gas producer to discover the Nauvoo field.

Production casing was set at 1,069 feet, 10 feet below top of the Bangor limestone, and all the section, to total depth of 2,005 feet, was acidized with 2,000 gallons. On April 17, 1945, the well tested through open 2½-inch tubing, flowing at the rate of 785,650 cubic feet of gas per day; shut-in top pressure was 410 pounds.

TABLE I

County	*Location*	*Well*	*Total Depth (Feet)*	*Formation Penetrated*
Clarke	15-7N-4E	Beattie, Gordon-Hearn 1	5,267	Basal Tuscaloosa
Clarke	25-10N-1W	California, Scotch Lbr. 1	5,154	Basal Tuscaloosa
Clarke	6-7N-1E	California, White City 1	4,009	Basal Tuscaloosa
Clarke	21-5N-2E	Danciger, State 1	4,507	Comanche
Escambia	32-3N-11E	Hunt, Miller 3	5,731	Comanche?
Marengo	18-12N-1E	Hutchings, Wadlington 1	4,230	Comanche
Mobile	25-2N-1E	Cauble, et al, Boykin 1	7,502	Selma chalk
Mobile	8-4S-2W	Danciger, Geisler 1	8,530	Comanche
Sumter	36-19N-4W	Gwin, Allison 1	2,617	Comanche
Washington	9-8N-2W	Parks-Fisher, Hobson 1	5,506	Comanche
Washington	12-8N-3W	Wayne Refg., Mitchell 1	5,527	Comanche
Wilcox	32-12N-10E	Seaboard, McConnico 1	5,780	Igneous
Wilcox	32-12N-5E	Southern Natural, Stokes 1	4,305	Comanche

Producing beds include all porous zones of the Bangor, Hartzell, Gasper, and Tuscumbia formations of the Mississippian.

This well is located slightly more than ½ mile northeast of The Superior Oil Company's First National Bank of Birmingham No. 1, which was abandoned at total depth of 1,856 feet in April, 1943. Showings of gas were encountered in this well but were considered non-commercial.

Most significant of the dry wildcats was the Southern Natural Gas Company's G. W. Morgan Estate No. 1, Sec. 32, T. 12 N., R. 5 E., Wilcox County.

This test, abandoned at total depth of 8,250 feet, penetrated 100 feet of Eagle Mills salt, from 8,150 to bottom of the hole, extending the salt basin well beyond the previously considered limits. The known presence of salt at this point will be of value as related to geophysical interpretation.

Other wildcats which added to knowledge of subsurface structure and stratigraphy are listed in Table I.

At the end of the year there were 3 active wildcats in operation: 2 in the Paleozoic area of northwest Alabama, the third in southwest part of the state.

The Gilbertown field, Alabama's only oil-producing area, had a total of 18 wells drilled in 1945. Four wells were abandoned as dry, 7 were completed as pumping wells from fracture zones in the Selma chalk, and 7 produced from the upper Eutaw sands.

The Carter Oil Company extended the Gilbertown production eastward approximately 2½ miles by completing Sam Alman No. 1 in Sec. 5, T. 10 N., R. 3 W., as a producer from the upper Eutaw. Two additional producers were added to this extension area by the end of 1945.

Production from the Gilbertown field during 1945 is shown by months in Table II.

TABLE II

Month	*Production for Month (Barrels)*
January	7,953
February	10,308
March	10,999
April	13,727
May	17,636
June	23,027
July	25,094
August	21,546
September	5,950
October	7,862
November	19,141
December	23,574
Total, 1945	186,817
Total, 1944	56,064
Total accumulated	242,881

Only one well was active in Gilbertown field at the year's end: the Carter Oil Company was making production tests on Sam Alman Unit No. 1.

A slight increase was noted in geophysical and core drill work as compared with 1944 in Alabama, and as heretofore the concentration of work was in southern and southwestern part of the state.

Table III gives the number of crew weeks by month and method during the year.

In 1946 it is anticipated that geophysical exploration will show a definite decline unless a new producing area is established to furnish a definite lead.

Drilling activity should maintain the rate followed for the past 2 years unless, again, a new field is discovered.

FLORIDA

In 1945, there were 14 wildcat wells drilled and abandoned in Florida, of which 11 were located in the north and northwest "panhandle" counties, and 3 were in southern or peninsular counties. In 1944 there was a total of 5 wildcats drilled.

In Table IV there are listed several of the more significant of the exploratory wells.

TABLE III

	Core Drill	*Gravity Meter*	*Magnetometer*	*Seismograph*	*Total*
January	10	51	5	27	93
February	7	46	6	22	81
March	11	35	7	23	76
April	17	39	7	23	86
May	17	40	5	25	87
June	18	38	3	24	83
July	18	38	0	27	83
August	23	49	5	26	103
September	27	48	8	21	104
October	32	50	8	21	111
November	31	42	2	22	97
December	31	39	0	25	95
Total 1945	242	515	56	286	1099
Total 1944	42	487	25	280	834
Total 1943	2	106	5	100	213

On the first of the year there were 6 wildcats being drilled and another waiting on rig.

Two wells were drilled in the Sunniland field in Collier County, adding 1 producer and 1 dry hole.

Humble Oil and Refining Company's Gulf Coast Realty Company No. 4, Sec. 20, T. 48 S., R. 30 E., was completed as the second producing well in Florida's only field.

The Gulf Coast Realty No. 4, is 1½ miles north and slightly west of the discovery well, Gulf Coast Realty No. 1, and is structurally about 40 feet higher on top of the producing zone.

First production tests on Gulf Coast Realty No. 4 were made in May, 1945, at which time the well flowed oil with a gradually increasing percentage of salt water and decline in oil and gas. Pump was installed and well completed on June 21, pumping 257 barrels of 19.2 °API gravity oil and 161 barrels of salt water per day.

TABLE IV

County	*Location*	*Well*	*Total Depth (Feet)*	*Formation Penetrated*
Bay	21-3S-15W	Magnolia, State 1	7,003	Comanche
Calhoun	31-1S-10W	Pure, International Paper 1	5,096	Comanche?
Calhoun	25-1N-11W	Pure, St. Andrews 2	4,457	Lower Tuscaloosa?
Charlotte	17-42S-23E	Humble, Lownes-Treadwell 1	13,300	Comanche
Dade	30-55S-36E	Humble, State 1	11,789	Comanche
Gulf	21-6S-9W	Pure, Hopkins 2	7,255	Comanche
Gulf	10-7S-9W	Pure, St. Joe Paper 1	5,796	Comanche?
Madison	5-2S-11E	Hunt, Gibson 4	4,069	Lower Tuscaloosa?
Santa Rosa	8-5N-28W	Hunt, Foshee-Miller 2	6,597	Comanche?

TABLE V

	Production by Month 1945 (Barrels)	*Production by Month 1944 (Barrels)*
January	112	2,103
February	403	1,404
March	578	1,100
April	403	1,054
May	725	1,115
June	4,109	822
July	5,700	1,123
August	4,455	957
September	2,775	516
October	2,977	608
November	2,666	581
December	2,717	449
Total	27,618	11,832
Total accumulated 1943 through 1945: 43,487 barrels.		

One mile north of Gulf Coast Realty No. 4, Gulf Coast Realty No. 7, Sec. 17, T. 48 S., R. 30 E., was drilled to total depth of 11,842 feet and abandoned. The No. 7 was approximately 150 lower on top of the productive zone than Gulf Coast Realty No. 4.

Production from the two Sunniland field producers during 1945 is shown in Table V. Comparison is made with monthly production from Gulf Coast Realty Company No. 1 in 1944.

At the end of the year one well, Gulf Coast Realty No. 6, Sec. 19, T. 48 S., R. 30 E., was drilling one mile west of No. 4.

TABLE VI

	Core Drill	*Gravity Meter*	*Magnetometer*	*Seismograph*	*Total*
January	32	63	15	12	122
February	35	58	19	12	124
March	38	62	14	15	129
April	40	53	18	16	127
May	50	77	16	20	163
June	35	60	8	14	117
July	33	58	9	13	113
August	46	73	12	14	145
September	31	51	12	14	108
October	34	57	11	10	112
November	27	46	6	4	83
December	24	40	5	4	73
Total 1945	425	698	145	148	1,416
Total 1944	299	843	132	123	1,397
Total 1943	98	59	9	51	217

TABLE VII

County	*Location*	*Well*	*Total Depth (Feet)*	*Formation Penetrated*
Atkinson	Lot 71, Dist. 7	Sun, Doster-Ladner 1	4,298	Basement
Echols	Lot 317, Dist. 13	Hunt, Superior Pine 2	4,066	Basement
Laurens	Unsurveyed area ½ mi. S. of Minter	Calaphor, McClain 1	2,548	?
Toombs	Unsurveyed area 5 mi. S. of Lyons	Tropic, Gibson 1	3,681	Quartzite

Geophysical and core drill work in Florida showed a very slight increase over 1944. Slight gains in core drill, magnetic, and seismic work offset the decline in use of gravity meter.

Table VI gives the number of crew weeks work done in 1945 by month and method.

It is the writer's opinion that wildcat drilling will increase in 1946, particularly in north Florida and in the panhandle counties. An adequate distribution of subsurface control has been established in this area to allow for more accurate geophysical interpretation.

GEORGIA

Five wildcat wells were drilled and abandoned in Georgia during 1945, equalling the record for the previous year. One of the wells was junked at a depth too shallow to be considered significant, the other four are listed in Table VII.

Two of the wells listed in Table VII reported slight oil showings which were definitely below commercial consideration. The Sun Oil Company's Doster-

TABLE VIII

	Core Drill	*Gravity Meter*	*Magnetometer*	*Seismograph*	*Total*
January	0	12	0	0	12
February	0	12	0	0	12
March	0	25	0	0	25
April	0	19	0	0	19
May	0	21	13	0	34
June	0	9	15	0	24
July	0	11	8	0	19
August	1	10	7	0	18
September	3	10	0	0	13
October	1	14	0	0	15
November	0	9	1	0	10
December	0	11	3	0	14
Total 1945	5	163	47	0	215
Total 1944	0	60	106	43	209
Total 1943	0	47	27	20	94

Ladner No. 1 reported slight stain and odor at 3,271–3,276 and 3,470–3,480 feet; however, drill-stem tests of the intervals recovered mud and drilling water with no showings.

In Toombs County, the Tropic Oil Company's Gibson No. 1 was abandoned at total depth of 3,681 feet in quartzite after failure of repeated attempts to drill-stem test the zone from 2,999 to 3,056 feet.

Core-drill and geophysical exploration increased from 209 crew weeks in 1944 to 215 in 1945, with principal gain and majority of work being done by gravity meter. Table VIII gives crew weeks by each method during each month of 1945.

No increase in drilling or exploratory work is anticipated for the coming year.

MISSISSIPPI

NEW FIELDS

In 1945 there were a total of 117 wildcats drilled, which led to the discovery of 5 new fields. The significant features related to these discoveries and subsequent development follow.

1. *Langsdale*—The Langsdale field is in southeast part of Clarke County near the Alabama line. The field was discovered by the Kirby Petroleum Company's Long Bell Petroleum Company No. B-1, Sec. 30, T. 1 N., R. 18 E., which was completed on January 18, 1945.

This discovery may be credited directly to surface geology, for it was through such exploration that the fault pattern which controls production was originally mapped.

Location for the Kirby Petroleum Company's discovery well was staked in the NW. $\frac{1}{4}$, NW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 30, T. 1 N., R. 18 E., after the fault plane was projected from its known surface position to be desired point in the subsurface.

At the spot of the drill site, beds of Claiborne age are faulted to the surface in an area of normal outcrop of Jackson Clay. Two faults are recognized in the well: the first at 1,520 feet in middle Wilcox has approximately 90 feet of displacement; the second, at 2,790 feet, faults out 400 feet of lower Midway and upper Selma chalk.

Top of the Eutaw was encountered at 3,644 feet, and oil showings were cored in all sands from 3,644 feet to the oil-water contact at 3,776 feet (−3,540). The productive sands have been designated in alphabetical sequence from first sand near top of Eutaw.

The discovery well was cored and drilled to 5,620 feet in Comanche and was then plugged back to test the Eutaw, since no showings were noted below that horizon.

Casing was set and cemented at 3,755 feet and first test was made on open hole after drilling out to 3,790 feet. For this test of the "D" sand, casing was bailed down, showing salt water with a showing of oil.

The well was then plugged back to 3,740 feet and perforated in the "A" sand

at 3,650–3,660 feet, in the "B" sand at 3,697–3,707 feet, and in the "C" sand at 3,729–3,739 feet. Pump was installed and clean oil was produced at the rate of 156 barrels per day. Corrected gravity of the oil is 18.1° API.

Subsequent drilling has brought the productive total to 17 wells, while only 3 dry holes had been abandoned. The one active well at the end of the year was waiting on storage and has since been completed.

None of the wells has encountered accumulation of oil in sands other than upper Eutaw and the water level as established by the discovery well is effective for the entire productive zone; interchange of oil from sand to sand probably being effected by means of the fault plane.

The strike of the faults is in general east and west, with the upthrown productive side on the south. Productive closure of 154 feet has been proved from top of the "A" sand on the highest well, Kirby's Long Bell No. D-1, to the water level. In subsea depths this range is from 3,386 to 3,540 feet.

The faults at Langsdale are a unit of the fault system which is productive in the Gilbertown field, Choctaw County, Alabama, but subsurface data do not indicate a direct relation of the production-controlling faults.

2. *Soso.*—The Soso field is in the extreme southwest part of Jasper County, 1½ miles east of the intersection of Jasper, Jones, and Smith counties.

The area had been worked with gravity meter and seismograph by the Gulf Refining Company prior to staking location for Edwards-Bailey No. 1 in the NW. ¼, SE. ¼ of Sec. 27, T. 10 N., R. 13 W.

The surface formation in the area of the location is lower Catahoula sandstone of Miocene age below which the well penetrated the geologic sequence to the basal part of the Gulf Cretaceous.

No showings were noted in the first sands encountered in the Eutaw from 6232 to 6,587 feet. From 6,587 to 6,640 feet a sand occurs which has high resistance on the electrical log from 6,587 to 6,625 feet; cores in the sand had a strong gas-condensate odor. This sand is the equivalent of the Christmas or basal Eutaw sand of Heidelberg field.

A drill-stem test, 6,592 to 6,650 feet, flowed gas with a spray of water-white condensate.

The well was cored ahead but no further showings were recovered above the Marine shale.

In the lower Tuscaloosa above the "Massive" sand a showing of heavy oil was cored in thin stringer sands at 7,771–7,774, 7,778–7,782, 7,820–7,827, and 7,828-7,834 feet. A drill-stem test at 7,820–7,830 feet recovered mud, cut with heavy black oil.

Later cores in the "Massive" sand proper had salt water to total depth of 8,153 feet.

Several production tests were attempted on the heavy oil showings but excessive percentages of salt water and the 9.2° API gravity oil did not encourage continuation of production tests.

For completion the well was perforated from 6,590 to 6,600 feet and on initial gauge the well flowed at the daily rate of 3,150 MCF gas and 97 barrels of 67° API gravity condensate through $\frac{1}{4}$-inch tubing choke; tubing pressure was 2,500 pounds and gas-condensate ratio 31,700:1. Calculated open flow is 56,000 MCF gas per day.

Following the initial tests on March 1, 1945, the well was shut in until July at which time it was opened to furnish fuel for a drilling well in the vicinity.

A study of the electrical logs in the area adjacent to the Soso field reveals the lenticularity of the upper member of the Christmas sand which is producing in Edwards-Bailey No. 1. Wells south and west do not have this sand body developed, while wells northeast have a uniform development of porosity.

It is the writer's opinion that the relationship of the lenticularity of the sand to the evident structure accounts for the accumulation in that particular zone.

Only the discovery well has been drilled at Soso, and no definite plans have been announced for further development.

3. *Hub.*—The Hub field is in south-central Marion County and is crossed by the Pearl River which, in this area, marks an "end point" for Range surveys. Here fractional Range 14 E. is irregularly separated from fractional Range 18 W. by the river. The townships are unaffected.

Following detailed gravity and seismic surveys, the Humble Oil and Refining Company began drilling A. Evans No. 1 in the NW. $\frac{1}{4}$, NE. $\frac{1}{4}$ of Sec. 15, T. 2 N., R. 18 W., on September 28, 1944.

No showings of gas or oil were noted in cores or drill-stem tests taken above the Marine Tuscaloosa. First sand in the lower Tuscaloosa, at 9,067–9,090 feet, had gas-condensate, while the next sand at 9,103–9,128 feet, had gas-condensate at the top and oil in the base. Continuous porosity through the gas-oil contact and the short section of oil saturation made a low-ratio completion virtually impossible. The first salt-water sand occurs at 9,157–9,168 feet.

The "Massive" sand, at 9,236 to 9,487 feet, had salt water throughout. No sands were penetrated in the Comanche, which was topped at 9,487 feet.

Evans No. 1 was completed, March 3, 1945, from perforations at 9,127–9,129 feet, flowing 72 barrels of 52° API gravity condensate and 1,550 MCF gas per day through 5/32-inch tubing choke; tubing pressure was 3,000 pounds and gas-condensate ratio 14,750:1. On first tests from the same perforations, the well had made some 38° API gravity oil but also showed salt water which was channelling from below. The salt-water channel was successfully squeezed, and after several tests the well was finally completed.

The second completion at Hub, in Sec. 10, T. 2 N., R. 18 W., was the field's first dry hole. The California Company's W. E. Walker No. 1, $\frac{1}{2}$ mile northeast of Evans No. 1, cut a fault with 70 feet displacement in upper Wilcox, and another fault cut out 120 feet at top of the Marine Tuscaloosa, at 8,610 feet. At the top of the lower Tuscaloosa Walker No. 1 was 55 feet higher than Evans No. 1, but failed to encounter a porous sand of sufficient thickness above the water level.

The Evans producing sand was represented by only 5 feet of slightly porous sand at 9,079–9,084 feet, which, at that depth, did not justify a test.

The second producer, the Humble Oil and Refining Company's E. A. Ball No. 1, Sec. 20, T. 2 N., R. 14 E., is $1\frac{1}{4}$ miles southwest of Evans No. 1.

The E. A. Ball No. 1 cored and drill-stem tested gas and water-white condensate in the first porous sand below the chalk to establish the basal Eutaw and upper Tuscaloosa as a productive possibility. The Ball No. 1 had the top of the lower Tuscaloosa 110 feet higher than Evans No. 1 and had gas-condensate in a sand at 9,025–9,080 feet. This sand is correlative with the salt water sand in Evans No. 1 at 9,157–9,168 feet.

The "Massive" sand in Ball No. 1 has oil saturation from the top at 9,112 to 9,130 feet. Slight oil stain extended to 9,140 feet but is thought to be associated with salt water. The well is completed from perforations at 9,123–9,127 feet, flowing 108 barrels of 35.4° API gravity oil in 24 hours through $\frac{1}{8}$-inch tubing choke; tubing pressure was 1,100 pounds; gas-oil ratio 625:1.

The E. A. Ball No. 1 is first oil producer in the field and also first to produce from the "Massive" sand proper.

The only other completion during 1945 was a north offset to E. A. Ball No. 1. The Humble Oil and Refining Company's E. O. Ball No. 1 was also completed as an oil well from perforations in the "Massive" sand at 9,125–9,129 feet.

From the core, drill-stem test, and electrical log records on the 4 completions, a sub-sea gas-water contact in the upper Tuscaloosa at 7,947 feet is indicated; in the lower Tuscaloosa, as a result of similar information, the sub-sea depths for the gas-oil and oil-water contacts are 8,980 and 9,000 feet, respectively.

At the beginning of 1946, one well was drilling in the field: the Humble's E. A. Ball No. 2, which is $\frac{3}{4}$ mile southeast of E. A. Ball No. 1.

4. *Fayette.*—The Fayette field is in west-central Jefferson County, and was discovered by preliminary geophysical exploration, and later drilling of the Humble Oil and Refining Company's M. R. Smith No. 1, Sec. 12, T. 9 N., R. 1 E.

First showing in M. R. Smith No. 1 was noted in cores in upper Wilcox, the top of which is recognized at 3,633 feet. The sand indicated on the electrical log from 3,633 to 3,656 feet was drill-stem tested and flowed gas with a trace of salty water; top pressure was 750 pounds while flowing on $\frac{1}{4}$-inch top choke. Another gas showing was recovered in sand at 3,681–3,685 feet, while sand with gas odor and light oil stain occurs at 3,685–3,689 feet. Drill-stem test at 3,683-3,688 feet flowed dry gas through $\frac{1}{8}$-inch top choke with top pressure of 1,470 pounds. No showings were noted in the Wilcox below 3,689 feet.

No sands occur in the Eutaw of this area and all the upper Tuscaloosa sands show salt water in Smith No. 1.

Top of the lower Tuscaloosa is 9,584 feet with first slightly porous sand from 9,640 to 9,650 feet showing gas. The "Massive" sand extends from 9,670 feet to top Comanche at 9,740 feet and has gas-condensate in the upper part and oil at the base.

The Comanche was penetrated from 9,740 to 11,300 feet; interbedded porous sands and shale occur from 10,805 to 11,120 feet. A short string of 5-inch liner was set at 11,072 feet to test a possible showing in sand at 10,930–10,987 feet. The liner was perforated at 10,930–10,940 and drill-stem tested, but recovery was only salt water with no oil or gas showings.

Prior to making production test on the "Massive" sand, casing was perforated below and above the sand, from 9,750 to 9,753 and from 9,625–9,628 feet, and squeezed to insure a shut-off of salt-water channelling.

Completion perforations were made from 9,730 to 9,736 and the well flowed 217 barrels of 37.4° API gravity oil in 24 hours through $\frac{1}{8}$-inch tubing choke; tubing pressure was 1,925 pounds and gas-oil ratio 1,500:1; shake-out showed 0.2 per cent basic sediment and water. Since completion, the ratio has shown a slight increase and the well makes approximately 5 per cent sediment and water.

At the first of the present year 3 wells were active at Fayette: 1 was drilling and 2 were making production tests.

The Humble Oil and Refining Company's M. R. Smith No. B-1, Sec. 16, T. 9 N., R. 1 E., is 3,800 feet northeast of M. R. Smith No. 1. It is 31 feet lower than the discovery well on top of lower Tuscaloosa, and the "Massive" sand is not so well developed.

The Humble Oil and Refining Company's S. Hirsch Company No. 1, Sec. 15, T. 9 N., R. 1 E., is 3,200 feet southeast of the discovery, and is 37 feet lower on top of the lower Tuscaloosa.

Both wells were approximately 20 feet lower than the discovery on top of the Wilcox and appear to have only slight showings in the first sand.

At present, Fayette seems to be predominantly a gas-condensate reserve with an estimated maximum oil column of 30 feet determined by results of tests on the first three wells. Favorable development of the "Massive" sand through the approximate sub-sea range of 9,515 to 9,545 feet will be necessary to achieve a satisfactory oil completion.

5. *Quitman.*—The Quitman field is in central Clarke County, and in the immediate vicinity of one of the earliest tested oil showings in Mississippi.

The field was discovered by L. J. Roussell's Long Bell Petroleum Company No. 1, in the SE. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 10, T. 2 N., R. 16 E., which was drilled on the basis of heavy oil showings in the upper Eutaw in other wells in the area.

First well to note this oil showing was the Gulf Refining Company's Long Bell Lumber Company No. 1, which was drilled to test a faulted surface and core-drill prospect. The location is in the SW. $\frac{1}{4}$, SW. $\frac{1}{4}$ of Sec. 10, T. 2 N., R. 16 E., west offset to the discovery-well tract. The Gulf well cored a showing of oil at 3,692–3,700 feet near the top of the Eutaw and, after drilling to total depth of 4,775 feet in Tuscaloosa, plugged back to set $6\frac{5}{8}$-inch casing at 3,685 feet. Bailer was run, recovering 17.8° API gravity oil and salt water. The water increased and the well was abandoned, January 6, 1932.

Other wells have been drilled in the area since 1932 and several have recorded similar oil showings. None has accomplished a successful test.

Roussell's Long Bell Petroleum Company No. 1 had the top of the Eutaw at 3,625 feet and, from the electrical log, the producing sand occurs at 3,714–3,718 feet.

Casing was perforated at 3,715–3,717 feet with 14 shots and on October 21, 1945, the well was completed, pumping 37 barrels of 13.6° API gravity oil plus 5 per cent salt water. The well was produced for only a few days following the initial tests and has been shut in since that time. No production has been reported to the State Oil and Gas Board.

It is the writer's opinion that the salt-water percentage will increase with sustained production and that the areal extent will be limited.

No plans for further development have been revealed.

DEVELOPMENTS IN FIELDS DISCOVERED PRIOR TO 1945

Two hundred twelve wells were drilled in 14 fields discovered prior to 1945, adding 172 producers and 40 dry holes to the state totals. The Eucutta, Heidelberg, and Cranfield fields accounted for 137 of the producers and 29 of the dry holes. The remaining wells were drilled in 11 different producing areas.

Significance of the developments in each of the fields is as follows.

1. *Baxterville field.*—The Baxterville field, Lamar and Marion counties (No. 36 on index map), had 14 wells drilled during the year, adding 12 producers and 1 dry hole. The other well was junked at the total depth of 8,755 feet and twinned, so is not counted in the state total.

Only the discovery well, the Gulf Refining Company's C. V. Cooper No. 1 was producing low-gravity oil from basal Tuscaloosa "Massive" sand on the first of the year; gas-condensate sands were cored in lower Eutaw and upper Tuscaloosa, but were not perforated for production in the discovery well.

First completion for 1945 and second producer in the field was The Superior Oil Company's R. Batson *et al.* No. 1, Sec. 17, T. 1 N., R. 16 W., extending the field 1½ miles southeast.

The R. Batson *et al.* No. 1 cored gas-condensate sands in lower Eutaw and upper Tuscaloosa and heavy oil from the "Massive" sand. This well was dually completed, producing gas-condensate from upper Tuscaloosa perforations at 7,796–7,810 feet and flowing 16° API gravity oil from open hole in the "Massive" sand from 8,772 feet to total depth of 8,846 feet.

The thirteen producers are completed as follows: 6 as "Massive" sand low-gravity oil wells; 6 as dually completed "Massive" sand oil wells and upper Tuscaloosa gas-condensate wells; 1 as an upper Tuscaloosa gas-condensate well.

Reservoir data as revealed by the wells drilled to date indicate a water level in the upper Tuscaloosa which is slightly irregular due to lenticular development of the sands, and to structural position in regard to the various faults. An approxi-

mate water level for this zone of minus 7,600 to minus 7,650 feet may be used. Some oil showings are present overlapping this gas-water contact, but they have not occurred with sufficient separation from the gas and water to prove a productive possibility.

A variable water level in the "Massive" sand is probably related to minor adjustments which have taken place in the various fault segments. Not many points of control have been available, but the oil-water contact appears to vary from minus 8,565 to minus 8,610 feet.

At least 2 wells, which are "high" in lower Wilcox, have gas and possible oil showings of sufficient extent to warrant later considerations. The Sun Oil Company's F. M. Snowden No. 1, Sec. 7, T. 1 N., R. 16 W., has sands which have favorable character on the electrical log as follows: 4,460–4,484, 4,497–4,507, 4,805–4,815, 4,816–4,844, and 5,075–5,090 feet. Other sands also indicate gas or oil showings, but are too thin or too argillaceous to warrant tests.

The Gulf Refining Company's Jonathan Davis No. 1, Sec. 7, T. 1 N., R. 16 W., is 52 feet lower structurally on a correlation point in lower Wilcox, and has a definite showing in only one sand, 4,851–4,890 feet. Side-wall samples were taken at 4,855, 4,865, and 4,875 feet, all of which had gas odor and taste. No tests have have been made on any Wilcox showing.

The structural development of Baxterville has revealed a graben fault system, though further control will be required to delineate definitely each of the faults.

The occurrence of the low-gravity oil in the "Massive" sand and the gas-condensate in upper Tuscaloosa, Wilcox, and in lesser amounts in the chalk are probably related to the faulting. It is thought that the lighter fractions have gained escape from the "Massive" sand by way of the fault plane, leaving the asphaltic, undersaturated crude and at the same time saturating the upper zones with gas-condensate.

The lack of a market for the low-gravity oil or for the gas has caused an almost continual shut-in of all the wells and has limited development to lease requirements.

At the first of the year there were 5 active locations in the field.

2. *Brookhaven field.*—The Brookhaven field, Lincoln County (No. 20 on map), had its first production development since 1943 and was extended by $1\frac{3}{4}$ miles south and $\frac{1}{4}$ mile west from the heretofore one-well field.

Roeser and Pendleton, Inc., drilled W. L. Case No. 1 in Sec. 8, T. 7 N., R. 7 W., to total depth of 10,475 feet, on acreage obtained in a farm-out agreement with The California Company and Sun Oil Company.

Casing was set at 10,391 feet and perforated 10,238–10,268 feet for first test which flowed oil with approximately 50 per cent salt water. Perforations were squeezed off with 150 sacks of cement.

For second test, cement was drilled out to 10,260 feet and again the well showed salt water, though in reduced percentage. Perforations were re-squeezed with 50 sacks of cement.

The third, and final, test was made after drilling cement to 10,254 feet to test the perforated interval from 10,238 to 10,254 feet in the top of the producing sand. The well was completed September 11, 1945, flowing 241 barrels of 37.3° API gravity oil per day through $\frac{5}{16}$-inch tubing choke.

Cores through the producing interval did not indicate salt water and the electrical log is indefinite so that some question may still prevail whether an oil-water contact was established by the first and second tests.

The original Brookhaven producer was The California Company's G. T. Smith No. 1, Sec. 4, T. 7 N., R. 7 E., which has pumped 24° API gravity oil since its completion (July 8, 1943). G. T. Smith No. 1 is producing from 10,136–10,175 and 10,288–10,322 feet in basal Tuscaloosa.

W. L. Case No. 1, 65 feet lower than G. T. Smith No. 1, also produces from basal Tuscaloosa but encountered a sand development much higher in the section, which may account for the differential in gravity of the oil.

Northwest and west offsets to W. L. Case No. 1 were being drilled at the end of the year.

3. *Bruinsburg field.*—The Bruinsburg field, Claiborne County (13 on map), had only 1 test completed during 1945 and the field remains a one-well dry-gas producer. It is the only production thus far developed on a shallow piercement dome in Mississippi.

The Sun Oil Company's W. R. Hammett No. 2, Sec. 2, T. 11 N., R. 1 W., was abandoned after drilling and coring to total depth of 4,425 feet in Wilcox. Only slight showings were noted in the well.

The Wilcox was penetrated from 2,768 to 4,427 feet and continuous cores showed beds which were in almost vertical position.

The W. R. Hammett No. 2 is approximately 650 feet southwest of W. R. Hammett No. 1-A, discovery well of the Bruinsberg field.

Production of gas from Hammett No. 1-A has been for drilling purposes only on Hammett No. 2 and on Hammett No. 3. The Hammett No. 3, which had begun operations late in 1945, has since been shut down by high water, and the rig has been moved out temporarily.

Total production in the 13 months since completion has amounted to 33,827 MCF gas, of which 24,253 MCF was produced in 1945.

4. *Carthage Point field.*—The Carthage Point field, Adams County (15 on map), had 1 well completed early in 1945 and 1 well nearing completion at the end of the year.

The Pure Oil Company's J. M. McDowell No. 2 was completed on January 13, 1945, producing from perforations at 10,273–10,286 in the upper part of the basal Tuscaloosa "Massive" sand. Total depth is 12,148 feet, in Comanche.

McDowell No. 2, Sec. 12, T. 6 N., R. 2 W., is approximately 3,000 feet east of the discovery well for the field, Pure Oil Company's McDowell No. 1, and is less than 10 feet higher, indicating a broad, relatively flat structure.

The "Massive" sand is represented by an upper and lower section of porosity

extending from 10,268–10,325 and 10,365–10,392 feet, respectively. All of the lower section, and probably the bottom 13 feet of the upper, contains salt water. Although tests on the discovery well and McDowell No. 2 indicate presence of an oil column, it is undoubtedly too limited to be produced free of salt water or excessive gas.

Following a series of preliminary tests, the McDowell No. 2 was perforated from 10,273 to 10,286 feet with 108 shots and completed flowing 91 barrels of 54° API gravity condensate per day through $\frac{1}{8}$-inch tubing choke; tubing pressure was 3,200 pounds and gas-condensate ratio 22,385:1.

On the first of the year the Humble Oil and Refining Company was drilling the only active operation in the Carthage Point field, and it had cored showings of gas-condensate in the "Massive" sand to assure a $\frac{1}{2}$ mile eastward extension.

The Humble's McKittrick No. 1 is 17 feet higher than McDowell No. 2 on a correlation point near the top of the producing zone.

5. *Cary field.*—The Cary field, Sharkey County (3 on map), had 1 deep test, British-American Oil Producing Company's F. B. Houston Estate No. 3, drilled, which was stopped in lower Cotton Valley at total depth of 8,544 feet.

No showings were found below the Selma "Gas Rock" and the well was plugged back to be perforated at 3,272–3,274 feet and completed flowing 100 barrels of oil and 400 barrels of salt water per day.

Only 2 wells were producing in the Cary field on January 1, while 1 operation had spudded and shut down.

6. *Cranfield field.*—The Cranfield field, Adams County (16 on map), had 35 wells drilled during 1945, adding 8 producers from the Wilcox, 22 producers from the basal Tuscaloosa "Massive" sand, and 5 dry holes.

The Wilcox producers in the field now total 10, all of which are producing 39.5° to 40.5° API gravity oil from the "5,800-foot" sand approximately 1,750 feet below the top of the Wilcox.

There are now 33 wells completed in the "Massive" sand; 32 are producing 39° API gravity oil and 1 produces gas condensate.

The additional wells have developed a symmetrical structure which is elongate north and south. Although the circle of wells has not been completed, the structure has been developed sufficiently to indicate its approximate final size. The north-south length is about 4.2 miles, while the east-west width is 3.4 miles in the central part.

Gas-condensate production from the "Massive" sand should cover 5,000 acres, while 4,000 acres are estimated to lie within the "oil rim."

The Wilcox producing area should attain 700 acres on final development.

Cranfield had one deep test on the southwest edge during the year: The California Company's National Gasoline Company No. 10, Sec. 67, T. 7 N., R. 1 W., was drilled to total depth of 12,400 feet and abandoned after failure to find production in "Massive" sand or the underlying Comanche.

At the end of the year there were 8 active locations, 1 of which was to be a

Wilcox producer and 4 were in the oil band of the "Massive" sand; 2 were attempting a south and a northeast extension; 1 was to be a 12,000-foot test on top of the structure. That depth will penetrate the first Comanche porosity of the Paluxy.

The California Company, discoverer and principal operator in the Cranfield field, has taken initial steps toward effecting unitization of Cranfield "Massive" sand production. If successful in unitizing the royalty and lease interests, a recycling plant is contemplated.

7. *Eucutta field.*—The Eucutta field, Wayne County (32 on map), had more wells completed than any other in Mississippi during 1945. There were 72 wells drilled, adding 59 producers and 13 dry holes. All of the production is from the Eutaw on 91 wells which were producing at the end of the year.

Most significant development in Eucutta during 1945 was the discovery of oil production along a west fault which, to the extent proved, roughly parallels the east system. This new fault, upthrown toward the west, is a step fault in the western system of the graben fault structure.

Production in this new segment was discovered by the Gulf Refining Company's W. F. Davis No. 1, Sec. 2, T. 9 N., R. 9 W., which was cored from 5,090 feet in upper Eutaw to total depth of 5,271 feet.

Higher-gravity oil and a lower water level was determined by the cores and the drill-stem tests which were taken at two levels. Oil in Eucutta proper has ranged from 19° to 23° API gravity while W. F. Davis No. 1 recovered 33.3° API gravity oil from the City Bank sand at 5,163–5,180 feet, and 30.6° API gravity oil was recovered from the Stanley sand at 5,244–5,265 feet. The oil-water contact is recognized at 5,265 (−4,955) feet, or 75 feet lower than in east Eucutta.

At the first of this year there were 6 wells producing in this area but no current operations.

Still farther west, the Humble Oil and Refining Company drilled the highest well to date in the Eucutta area but failed to encounter any showings of oil. After cutting a fault with approxmately 375 to 400 feet displacement at top of the Cretaceous, the top of Eutaw was recognized at 4,782 (—4,401), or 480 feet above the Eucutta oil-water contact. The well was drilled and cored intermittently to total depth of 6,703 feet, in Comanche, and abandoned on November 24, 1945.

Three wells were drilling on January 1 in Eucutta, all in the east part of the field.

8. *Flora field.*—The Flora field, Madison County (8 on map), had only 2 wells added to the 1 well which was producing at the first of 1945. One of the additional producers was result of a new well being drilled, while the second was reworked from an abandoned producer.

One well was active at the end of 1945.

9. *Gwinville field.*—The Gwinville field, Jefferson Davis County (21 on map),

added 9 wells in 1945 to raise the productive total to 12. No dry holes have been drilled in the field since its discovery.

Gwinville was, on the basis of the discovery well, first called a gas-condensate discovery field, and though there have been 4 wells completed which are producing oil, it is as yet predominantly a gas reservoir.

A graben fault structure has been indicated at Gwinville but the rather widespread spacing does not afford control for detailed mapping of the various faults, though the strike is generally northwest and southeast.

Only gas-condensate has been found in the north producing area with productive closure of at least 450 feet established from the top of first gas sand on Sid Richardson's Berry No. 1 to the water level at approximately minus 7,700 feet.

Gas, oil, and salt water alternate in the basal Eutaw and upper Tuscaloosa sands in the southern producing area.

There are not sufficient data as yet afforded by the 7 wells to determine definite gas-oil or oil-water contacts for the various sands of Eutaw and upper Tuscaloosa.

The Gulf Refining Company's D. Lee Mullins No. 1 is still the only producer from a basal Tuscaloosa sand. Other wells have recovered showings in this zone and production tests have been made without favorable result.

The Gulf Refining Company's V. G. Gholar No. 1, Sec. 27, T. 9 N., R. 19 W., was the first oil producer from an upper Tuscaloosa sand. Gholar No. 1 is a north offset to Mullins No. 1.

Since showings of oil and gas were recognized in Mullins No. 1 below the first occurrence of salt water in the upper Tuscaloosa, decision was made to core Gholar No. 1 continuously from the first sand in the lower Eutaw to the top of the Marine Tuscaloosa. From this cored section and by information rendered from 15 drill-stem tests, 215 feet of productive sand was determined, of which approximately 40 feet was oil sand.

On a correlation point in the lower Tuscaloosa, Gholar No. 1 is structurally 40 feet higher than Mullins No. 1, but the Mullins producing sand had "shaled-out."

This first good porosity in the lower Tuscaloosa was encountered at 9,265 feet and had a noticeable gas odor. Production tests were attempted but showed salt water with only a trace of oil.

Gholar No. 1 was completed on May 24, 1945, flowing through perforations at 8,570–8,578 feet in upper Tuscaloosa. Completion gauge was 336 barrels of 41.2° API gravity oil in 24 hours through $\frac{3}{16}$-inch tubing choke; flowing pressure was 2,550 pounds and gas-oil ratio 2,965:1.

Two later wells, slightly higher than Gholar No. 1, have been completed as oil wells in the upper Tuscaloosa by the Humble Oil and Refining Company. Denkmann Lumber Company No. 1, north offset to Gholar No. 1, is producing from a sand 280 feet above the stratigraphic position of the "Gholar" sand which,

however, was "shaled-out." For completion, Denkmann No. 1 was perforated at 8,262–8,264 feet. This producing level had a showing of oil in Gholar No. 1 and was drill-stem tested, recovering 700 feet of 41° API gravity oil and 2,000 feet of salt water. The "Mullins" sand of the lower Tuscaloosa was not developed in Denkmann No. 1.

The Humble Oil and Refining Company's Denkmann Lumber Company No. B-1 produces oil from a third upper Tuscaloosa section 100 feet above the "Gholar" sand. Production perforations are at 8,436–8,440 feet. The "Gholar" and "Mullins" sands are both well developed and contain gas condensate. Although the Denkmann No. B-1 does not have as complete a core and test record as was available on Gholar No. 1, the electrical log indicates a probable productive sand thickness of 300 feet, of which at least 40 feet is oil-saturated.

In addition to the 106,909 barrels of oil and condensate, the Gwinville field wells marketed for drilling purposes a total of 688,938 MCF gas during 1945.

At the end of the year 2 operations were active in Gwinville; 1 for each the north and south producing segments.

10. *Heidelberg field.*—The Heidelberg field, Jasper County (23 on map), had 63 wells completed in 1945. Of this total, 31 were oil producers and 6 were dry in east Heidelberg; 17 were oil producers and 9 dry in west Heidelberg.

In the east producing area no developments of note were provided by the 37 wells, most of which were located on edge tracts, on tracts very near the fault, or on property which had not been drilled due to legal delays.

Development in west Heidelberg served principally to prove the complication of the faulting in that area.

Three wells caused a temporary revival of interest in deeper zones than those previously determined.

The Gulf Refining Company's Mrs. L. P. Thornton No. 5, Sec. 36, T. 1 N., R. 12 E., produced oil from the lower Eutaw "Christmas" sand at a sub-sea depth 140 feet lower than the normal Eutaw water level. Saturated sand was present at 5,293–5303 and 5,310–5,330 feet. This abnormal accumulation is limited in extent in the immediate vicinity of the fault which was crossed at 5,292 feet. Several other wells have failed in an attempt to find this lower water level.

The Southport Petroleum Company's C. C. McDonald No. 1, Sec. 35, T. 1 N., R. 12 E., produces from a sand near top of the Marine Tuscaloosa, at 6,254–6,267 feet. The top of the Marine Tuscaloosa is at 6,287 feet. The well was cored into the "Massive" sand and recovered showings of heavy black oil with salt water. McDonald No. 1 is producing 29.9° API gravity oil from perforations at 6,256–6,268 feet, but the absence of the showings in other wells indicates a limited productive area. McDonald No. 1 had normal accumulation in all sands of the upper Eutaw.

The Southport Petroleum Company's C. C. McDonald No. 2, north offset to McDonald No. 1, is the first and only producer from the basal Tuscaloosa

"Massive" sand in Heidelberg field, east or west. McDonald No. 2 had only the first, or Morrison, sand in the Eutaw above the normal water level, and no oil showings were noted from that point to 6,426 feet; at this depth, a fault of 140 feet was cut and the well faulted into the "Massive" sand. The oil-water contact occurs at 6,447 feet. Following two squeeze jobs, the well was successfully completed flowing 55 barrels of 23.4° API gravity oil per day; however, salt water has increased to 92 per cent and oil production has declined to 20 barrels per day after total production of less than 5,000 barrels of oil.

At the end of the year there were 3 wells in east Heidelberg which were testing, while no wells were active in west Heidelberg.

11. *Jackson field.*—The Jackson field, Rankin and Hinds counties (12 on map), had 3 wells drilled on the southeast side in search of possible flank oil accumulation.

Casing was set at the top of the Selma gas rock on each of the wells, but only 1 produced a small amount of 14° API gravity oil prior to abandonment.

Earlier wells, drilled during the development of the Jackson gas field, produced in excess of 20,000 barrels of heavy, asphaltic oil. All these wells are in Secs. 13, 14, and 15, T. 5 N., R. 1 E.

Gas production has dropped rapidly in Jackson and it is anticipated that the field will be completely abandoned within 5 years. Production for 1945 was 640,488 MCF gas and at end of the year there were but 16 wells still producing.

12. *Mallalieu field.*—The Mallalieu field, Lincoln County (24 on map), was the major disappointment of the year in Mississippi. After starting the year with only the discovery well producing from the "Massive" sand, the field had a total of 6 tests drilled, adding only 1 producer.

The California Company's J. S. Nordan No. 2, north offset to the discovery well, was completed on February 17, 1945, producing from perforations in the "Massive" sand.

The remaining wells in the field were abandoned due to erratic development of the producing sand.

No operations are currently active in Mallalieu.

13. *Pickens field.*—The Pickens field, Madison and Yazoo counties (5 on map), had 5 wells drilled in 1945, adding 3 producers to bring the field total to 43 wells.

14. *Tinsley field.*—The Tinsley field, Yazoo County (4 on map), had a revival of interest due to extension of production to greater depths in the Eutaw, though the hope for discovery of Cotton Valley or Smackover production suffered by failure of the Union Producing Company's Jennie Stevens No. 21 in the Smackover limestone.

The Sohio Petroleum Company's (formerly E. C. Johnston) Brumfield No. B-1, Sec. 1, T. 10 N., R. 3 W., was completed on March 30, 1940, in the Woodruff sand. By May, 1945, production had dropped below the economic level and a work-over job was begun on June 6, 1945. Drill-stem tests were taken on the

Stevens and Lammons sands and both indicated favorable production possibilities.

The newly designated "Brumfield" sand is shown by electrical log to occur at 5,774–5,796 feet. The well was recompleted, following preliminary tests and squeeze jobs, on July 25, 1945, flowing 546 barrels of 46.6° API gravity oil per day. Subsequent drilling for this sand has revealed its lenticular nature, but production has been found in some one of the various sands by each of the attempts.

A total of 32 wells, including the Tinsley discovery well, were deepened below their original producing depths in the Woodruff sand. Most of these wells were drilled only to the first Eutaw sand: the Perry sand, which occurs 250 to 375 feet below the Woodruff sand.

The Union Producing Company's Jennie Stevens No. 21, was drilled to total depth of 11,626 feet, penetrating Smackover limestone from 10,845 feet to total depth. The top of the Cotton Valley is at 8,607 feet by electrical log. No showings of oil were recorded in the Cotton Valley; the Smackover, however, had showings through most of its extent but had no permeable development.

Production tests on the Smackover were unsuccessful and the well was plugged back for completion in a basal sand development in the Stevens sand zone at 5,409–5,420 feet.

At the close of the year 2 wells were being drilled in Tinsley.

SALT-DOME DEVELOPMENT

In addition to the 5 new producing areas, there were 3 new piercement domes discovered as a result of 1945 drilling.

The new domes are listed with data relative to the discovery well and to subsequent development.

1. *Arm.*—The Arm dome, Lawrence County, was correctly interpreted as being a piercement salt dome by the Gulf Refining Company geophysical work, and on the basis of that interpretation the Gulf drilled S. N. Hickman No. 1 to total depth of 9,276 feet in 1944 as a flank test. The Arm dome was officially discovered by the Humble Oil and Refining Company's S. M. Nelson No. 1, Sec. 8, T. 6 N., R. 20 W., which was completed, January 7, 1945. This well had the top of the cap rock at 1,218 feet, top of anhydrite at 1,410 feet, and top of salt at 1,932 feet, and was still in salt at total depth of 7,625 feet.

After drilling was completed, $5\frac{1}{2}$-inch casing was swung at 7,601 feet and the hole turned over to the geophysical department for detailed seismic work preparatory to selecting location for a deep flank test.

Following the exploratory work, location was made for V. L. Parkman No. 1, 2,400 feet north and slightly west of S. M. Nelson No. 1, and also in Sec. 8, T. 6 N., R. 20 W.

On the first of the year, Parkman No. 1 was still in operation, drilling the third hole below 7,500 feet, with no oil or gas showings reported. The original hole was drilled to 7,588 feet and abandoned after encountering top of cap rock at 6,930 feet and top of salt at 7,558 feet.

Cement plugs were set from 3,379 to 3,596 feet and directional hole drilled to total depth of 8,212 feet, which had the top of anhydrite at 8,204 feet. Again the hole was plugged back and another hole is being directionally drilled toward a point which would encounter the dome at still greater depth.

The 3 holes, on completion, will have encountered all porous sand zones from basal Eutaw to Comanche at or near the point of their contact with the dome—the position most favorable for accumulation.

2. *Hervey.*—The Hervey dome, Claiborne County, was discovered by the Sun Oil Company's B. D. Segrest No. 1, Sec. 7, T. 10 N., R. 5 E., which was completed June 22, 1945, at total depth of 3,554 feet in salt.

The well had the top of the cap rock at 3,325 feet, going from basal Claiborne into the cap; top of salt was recognized at 3,547 feet. Cores were taken in Cockfield and Sparta sands but no showings of oil or gas were noted.

No other tests have been drilled on the Hervey dome.

3. *Galloway.*—The Galloway dome, Warren County, was discovered by C. H. Osmond's Anderson-Tully Lumber Company No. 1, Sec. 43, T. 13 N., R. 3 E. The discovery well, completed on November 7, 1945, at total depth of 5,731 feet in salt, went from upper Wilcox into cap rock at 3,990 feet. This dolomitic limestone continues to 4,196 feet; the interval from 4,196 to 4,352 feet is brown shale; 4,352 to 4,432 feet is anhydrite; and 4,432 feet to total depth is salt.

There were no showings in the well, and no further drilling has been done on this salt dome.

In addition to the 3 newly discovered salt domes, other domes had exploratory drilling. Of the 117 wildcats drilled, 12 were on top or on the flanks of unproductive salt domes. There were also 11 sulphur tests drilled on the Richton dome.

A summary of drilling on each dome is as follows.

Byrd.—The Byrd dome, Greene County (39 on map), had 2 flank tests drilled by the Humble Oil and Refining Company, both in Sec. 20, T. 3 N., R. 7 W.

In 1944 the Gulf Refining Company "farmed out" the Byrd dome prospect to the Humble. As part of a detailed seismic survey, a 5,573-foot exploration hole was drilled on top of the dome in Sec. 16, T. 3 N., R. 7 W.

On completion of the exploratory work, location was made for Harry Stover No. 1 in the NE. ¼, NE. ¼ of Sec. 20, T. 3 N., R. 7 W., and drilling was begun, February 5, 1945. The well was abandoned on April 11, 1945, at total depth of 5,983 feet, in salt. The electrical log shows a faulted top of Cretaceous chalk at 4,822 feet; and indicates a chalk-cap rock contact at 5,620 feet. Top of salt was at 5,849 feet.

On September 16 the Stover No. 1 was cleaned out to 3,410 and then plugged back to whipstock at 3,161 feet. In order to drill directionally toward the flank of the dome, a number of whipstocks were set, by which method a depth of 6,883 feet was reached. Again the hole was plugged back and sidetracked but was finally abandoned at 6,850 feet, probably in upper Eutaw.

Between the original abandonment and deepening of Stover No. 1, the Humble Oil and Refining Company's Harry Stover No. 2 was drilled in the SE. $\frac{1}{4}$, NE. $\frac{1}{4}$, approximately 1,475 feet south of Stover No. 1. The Stover No. 2 was far enough removed from the dome to encounter a full section from the upper Miocene surface beds to Comanche.

No showings of oil or gas were reported on either of the two completed wells.

At the end of the year the Humble had begun operations on Harry Stover No. 3, approximately midway between Stover No. 1 and Stover No. 2.

Carson.—The Carson dome, Jefferson Davis County (27 on map), was also farmed-out by the Gulf Refining Company to the Humble Oil and Refining Company for exploration and drilling.

Prior to 1945 the Carson dome had only 1 test drilled: Gulf Refining Company's W. J. Price No. 1, Sec. 19, T. 7 N., R. 17 W., which discovered the dome in September, 1943.

As has been the practice in other cases, the Humble Oil and Refining Company's N. B. Dale No. 1, Sec. 24, T. 7 N., R. 18 W., was drilled to 7,050 feet, in salt, and turned to the geophysical department on March 1, 1945, for use in detailing the dome with the seismograph. Cap rock was reached at 2,530 feet and salt at 3,086 feet in this exploration hole.

Location for the Humble Oil and Refining Company's Williams and Sons No. 1 was made in the SE. $\frac{1}{4}$, SE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 13, T. 7 N., R. 18 W., northwest of the dome. The well was drilled to total depth of 10,426 feet in basal "Massive" sand or possible Comanche. The well appears to be abnormally low, suggesting a modified rim syncline around the dome.

No showings of oil or gas were encountered in the test and it was abandoned, October 3, 1945.

Another flank test, the Humble Oil and Refining Company's Andrew Barnes No. 1, Sec. 24, T. 7 N., R. 18 W., was drilling in salt at the first of the year. Barnes No. 1, approximately $1\frac{1}{2}$ miles southeast of Williams and Sons No. 1, had the top of the salt at 3,075 feet.

Kings.—The Kings dome, Warren County (6 on map), had 1 test drilled on the southeast flank, which was abandoned at total depth of 8,261 feet, in Tuscaloosa.

Showings of gas in the Claiborne and of heavy asphaltic oil in the top of the Wilcox had been found on early wells drilled by the Magnolia Petroleum Company on top of the dome.

With this encouragement, and following a core-drill program, the Magnolia Petroleum Company's Feld Estate No. 1 was drilled in Sec. 3, T. 16 N., R. 4 E. No showings were recognized at any point.

Lampton.—The Lampton dome, Marion County (34 on map), had 3 flank tests drilled by the Gulf Refining Company: E. H. Bradshaw No. 3, Sec. 29, T. 3 N., R. 17 W., on the south flank; E. H. Bradshaw No. 4, Sec. 21, T. 3 N., R. 17 W., and E. H. Bradshaw No. 5, Sec. 28, T. 3 N., R. 17 W., on the southeast flank.

The Bradshaw No. 3 was too far from the dome and was structurally low. At total depth of 9,622 feet the well had not reached top of the lower Tuscaloosa. It was abandoned with no showings on January 26, 1945.

Bradshaw No. 4 exhibits a relatively normal Claiborne and post-Claiborne interval but below that point encounters a section which is alternately complicated by tremendous faults and obvious elongation due to steep dips. The well appears to have penetrated part of upper Tuscaloosa before drilling false cap from 4,475 to 4,530 feet; top of cap rock at 4,630 feet; top of anhydrite at 4,690 feet and penetrating salt from 5,635 feet to total depth of 7,200 feet. On April 18 the hole was turned to the geophysical department and abandoned as a drilling well.

Bradshaw No. 5 is slightly farther from the crest of the dome, and as in Bradshaw No. 4, has only moderate structural disturbance in the beds through the Claiborne. Below that point very few definite correlations are possible due to similar conditions of faulting and steep dip which were mentioned as occurring in Bradshaw No. 4. It is probable, however, that Bradshaw No. 5 has "Massive" sand from 6,387 to 6,680 feet and Comanche from 6,680 feet to the top of anhydrite cap at 6,734 feet. Abandonment depth was 6,828 feet, at which point the well was still in anhydrite.

Leedo.—The Leedo dome, Jefferson County (17 on map), had 1 test on the southeast flank by the Gulf Refining Company which was abandoned on October 12, 1945, at total depth of 8,028 feet, in salt.

The Gulf Refining Company's Ella M. Cato No. 2, Sec. 30, T. 8 N., R. 4 E., is 900 feet northwest of Ella M. Cato No. 1, which, in 1944, drilled a thrust block, repeating 1,750 feet of Midway shale and Cretaceous chalk.

Cato No. 2 encountered some normal faulting which cut out the lower part of the Austin chalk and the Eutaw shale. Below that point the section of upper Tuscaloosa, Marine and lower Tuscaloosa is elongate due to steep dips. Probable top of Comanche is at 7,790 feet and the electrical-log top of the cap rock is 7,818 feet and top of the salt 7,892 feet. No further tests are in progress or anticipated in the near future on the Leedo dome.

New Home.—The New Home dome in the southeast corner of Smith County (22 on map), had 2 flank tests drilled and abandoned on the south flank of the dome.

The Gulf Refining Company's O. P. Foley No. 1, SE. $\frac{1}{4}$, NW. $\frac{1}{4}$ of Sec. 8, T. 10 N., R. 13 W., was abandoned at total depth of 2,269 feet on January 1 1945, after losing returns in cap-rock limestone, which was topped at 2,140 feet.

Following this abandonment, location for the Gulf Refining Company's E. G. King No. 1 was made, $\frac{1}{4}$ mile south of Foley No. 1.

King No. 1 has a normal section from the Catahoula sandstones on the surface to 7,547 feet, at which point a fault of approximately 220 feet displacement was crossed, cutting out lower part of the upper Tuscaloosa sands and upper part of the Marine Tuscaloosa shale. The test was cored and drilled from this point,

through a well developed "Massive" sand section, to the top of the Comanche at 8,296 feet. The well was abandoned on April 7 at total depth of 8,302 feet.

Detailed seismic re-check was completed during the summer months and decision was made to deepen the Foley No. 1. The geophysical interpretation suggested that the cap-rock material, in which the original hole was halted, overlay a salt overhang which, in turn, was expected to be underlain by the normal sedimentary section.

On July 23, the old hole had been cleaned out to bottom and drilling was resumed. Salt was encountered at 2,595 and extended to 3,510 feet. At 3,510 feet the well went from salt into middle Midway.

A steeply dipping, elongate chalk section was penetrated from 4,030 to 5,540 feet, at which point the well faults into Tuscaloosa. No definite correlation is possible from 5,540 feet to total depth, 6,341 feet, though it is probable that the "Massive" sand was present at bottom of the hole.

Richton.—The Richton dome, Perry County (38 on map), had 11 sulphur tests drilled by the Exploro Corporation which completed a program begun during the latter part of 1944. Slight non-commercial sulphur showings were found in a few of the tests.

The Gulf Refining Company's B. M. Stevens No. 1, Sec. 28, T. 5 N., R. 10 W., was completed as a west flank test for the dome.

Stevens No. 1 was cored and drilled to total depth of 8,874 feet, in Comanche, encountering normal sedimentary sequence from Catahoula to the Comanche. No showings were recognized in cores or suggested by the electrical log in uncored zones. The well was abandoned, December 19, 1945.

OTHER IMPORTANT WILDCATS

Wildcats were drilled during 1945, which failed to discover a new field or salt dome, but which were sufficiently significant to deserve mention.

The California Company's Mississippi Alluvial Farms No. 1, was drilled in Sec. 34, T. 12 N., R. 8 W., Issaquena County, to total depth of 9,237 feet, probably in Eagle Mills salt.

Prior to drilling, the area was worked by gravity meter and detailed by seismograph.

The top of the Smackover limestone was encountered at 7,999 feet and from that point to the probable base at 9,195 feet there was noted an irregular showing of heavy oil and gas in tight granular dolomitic limestone. Five drill-stem tests were taken at depths ranging from 8,013 to 8,837 feet which recovered only very slight oil showings.

After the hole was plugged back to 9,100 feet, $5\frac{1}{2}$-inch casing was set at 8,014 feet and plug drilled out to 9,200 feet to test the entire Smackover limestone section simultaneously.

The well was abandoned, March 24, 1945, after failure to yield any showings of oil or gas when bailed and swabbed.

Gulf Refining Company's E. S. Gambrell No. 1, Sec. 34, T. 10 N., R. 14 W., Jones County, was abandoned after making production tests on gas showings in the Eutaw formation. Total depth of the well was 9,035 feet, in Comanche.

Geophysical background for the test includes gravity-meter and seismograph surveys.

The showing of gas was noted in cores taken 7,038 to 7,060 feet in a middle Eutaw sand, which is equivalent to the Stanley sand of the Heidelberg field; a drill-stem test was taken at 7,041–7,060 feet which recovered 90 feet of gas-cut mud in 24 minutes. In later cores, a gas odor was recognized from 7,060 to 7,070 feet with salt water occurring below that depth in all sands of lower Eutaw and upper and lower Tuscaloosa.

Casing was set at 7,175 feet and production tests made on perforated intervals at 7,030–7,045 and 7,060–7,070 feet. The perforations were tested, squeezed, and re-tested but failed to indicate more than slight gas showing with salt water. The well was abandoned, June 9, 1945, as non-commercial.

National Associated Petroleum Company's Jeff Davis Heirs No. 1, was drilled on the Davis Island prospect in Warren County, indicating, but not proving, presence of another salt dome.

Original location was staked 2,460 feet south and 990 feet west of the southeast corner of the accretion to Sec. 23, T. 14 N., R. 1 E. Drilled to total depth of 5,401 feet, the well was abandoned when rising waters of the Mississippi River halted a fishing job which was in progress.

Second location, Jeff Davis Heirs No. 1-A, was made 120 feet east of the first and this test was drilled and cored to total depth of 7,557 feet, in Comanche.

Structurally the second well is approximately 100 feet lower than Jeff Davis Heirs No. 1 on correlation points within the Wilcox group; top of the Cretaceous is, however, more than 800 feet higher than in Waggoner Brothers' Parker No. 1, 2 miles north in Sec. 17, T. 14 N., R. 1 E. Such dips in this area are almost certain to indicate a piercement salt dome, the crest of which is probably within a mile of Jeff Davis Heirs No. 1.

C. H. Osmond's Armstrong-Ellislie No. 1, Sec. 31, T. 5 N., R. 2 W., Adams County, was abandoned after testing salt water with slight showings of gas from sands in basal upper Tuscaloosa and in "Massive" Tuscaloosa sands.

First showings in the well were noted in Wilcox cores, but the oil zone was not considered of sufficient thickness to justify production tests.

Slight gas odor was recognized in the basal Tuscaloosa "Massive" sand cores and casing was set on bottom at total depth 11,215 feet in Comanche.

Tests were made in the "Massive" sand at 11,180–11,190, 11,154–11,160, and 11,038–11,044 feet, and in base of upper Tuscaloosa at 10,537–10,547 feet. Salt water, with slight showing of gas was noted on each of the tests.

The well was abandoned, October 16, 1945.

Southern Natural Gas Company's Gammill Investment Company No. 1, Sec. 5, T. 9 N., R. 4 W., Yazoo County, has been temporarily abandoned at total depth

8,003 feet, in Comanche, after testing heavy black oil from an upper Tuscaloosa sand.

Heavy oil and asphalt showings were noted in cuttings and cores from this well, but the section at 6,766–6,778 feet appeared to have best possibilities. On

TABLE IX

County	*Location*	*Well*	*Total Depth (Feet)*	*Formation Penetrated*
Attala	5-14N-9W	Shell, Whelless 1	6,217	Paleozoic
Claiborne	51-13N-3E	Danciger, Taylor 1	9,906	Comanche
Claiborne	13-11N-3E	Pure, Chapman 1	10,128	Comanche
Copiah	15-1N-3W	Ark. Fuel, Carraway 1	10,305	Comanche
Copiah	1-9N-10E	Sinclair, Johnson 1	10,674	Comanche
Covington	22-7N-16W	Cities Serv., Aultman 1	9,708	Comanche
Covington	17-9N-16W	Mt. Vernon, Fee 1	9,648	Comanche
Covington	9-6N-14W	Warren, Johnson 1	9,333	Comanche
DeSoto	18-2S-9W	Union Prod. Withers 1	4,884	Paleozoic
Greene	11-4N-6W	Warren, Smith 1	8,469	Comanche
Hinds	15-3N-4W	Carter, Davis 1	10,000	Comanche
Hinds	29-4N-3W	Carter, Simmons 1	9,055	Comanche
Issaquen	27-13N-9W	Hunt, Nicholdson 1	6,872	Smackover
Jasper	9-10N-12W	Gulf, Gregory 1	8,292	Comanche
Jefferson	12-8N-4E	Tide Water, Buie 1	10,759	Comanche
Jones	23-6N-12W	Ginther, Mitchell 1	8,762	Comanche
Jones	5-9N-11W	Gulf, Geiger 1	8,200	Comanche
Jones	18-9N-13W	Gulf, Grayson 1	8,665	Comanche
Jones	19-9N-13W	Gulf, Smith Co. Oil 1	8,660	Comanche
Jones	4-9N-13W	Gulf, Valentine 1	8,305	Comanche
Lamar	5-5N-16W	Sinclair, Newman 3	11,393	Comanche
Montgomery	25-19N-6E	Black, Patterson 1	4,012	Comanche
Pearl River	20-1S-15W	Sinclair, Batson 1	9,588	Comanche
Newton	23-5N-13E	Sun, Citizens Bank 1	8,340	Ordovician?
Rankin	24-3N-5E	Atlas, Burnham 1	8,166	Comanche
Rankin	15-4N-5E	Carter, Nelson 1	8,004	Comanche
Scott	16-5N-6E	Pan-Am, School Land 1	7,450	Comanche
Scott	26-5N-6E	Pan-Am, USA 1	7,252	Comanche
Simpson	7-10N-17W	Hunt, Smith Co. 2	9,878	Comanche
Simpson	13-2N-1E	Sinclair, Bishop 1	9,560	Comanche
Smith	21-10N-14W	Gulf, Grissom-Ainsworth 1	8,490	Comanche
Tallahatchie	5-25N-3E	Ogg-Clark, Bardwell	3,650	Paleozoic
Warren	7-17N-4E	Sinclair, Blake 1	9,090	Comanche
Warren	1-14N-3E	Union, Harlen 1	11,726	Comanche
Washington	7-17N-8W	Killam, Fisher 1	7,068	Cotton Valley
Washington	35-15N-8W	Kingwood, Rucker 1	4,522	Smackover
Washington	22-17N-9W	Lisbon, Wynn 1	5,190	Smackover?
Wayne	23-7N-7W	Humble, GM&O D-1	8,570	Comanche
Wayne	30-9N-7W	Humble, GM&O E-1	8,512	Comanche
Wayne	23-7N-9W	Humble, USA 1	8,505	Comanche
Wayne	28-7N-9W	Woodley, USA 1	7,930	Comanche

production test this perforated interval showed salt water with some 14.6° API gravity oil. The well has been shut down since March and will probably see no further work or final abandonment until another test is drilled.

The original location was made on the basis of a core-drill structure; the area is being worked by seismograph before a second drill site is selected.

TABLE X

Field	Discovery Date	January	February	March	April	May	June	July	August	September	October	November	December	Total 1945	Accum. Total
Tinsley	9-5-39	849,993	790,936	801,397	792,611	788,671	778,420	781,375	794,677	756,934	744,005	728,545	724,861	9,332,425	86,180,938
Pickens	4-9-40	188,433	167,712	180,046	177,322	185,824	168,374	172,866	167,072	166,201	171,371	165,284	162,098	2,072,603	6,606,837
Heidelberg	1-30-44	268,284	243,708	276,308	273,026	239,982	244,728	248,980	250,137	198,890	223,705	208,846	221,746	2,898,340	4,338,939
Cranfield	10-6-43	95,839	111,779	123,300	127,589	145,708	144,285	171,933	187,904	213,066	236,772	256,222	288,378	2,102,775	2,641,088
Eucutta	10-7-43	113,221	118,598	155,096	170,188	168,978	180,142	205,706	217,283	177,042	180,774	181,189	192,205	2,060,422	2,516,417
Mallalieu	8-24-44	7,345	8,810	12,030	11,848	12,134	11,186	10,168	9,071	9,371	9,770	8,995	6,117	116,845	149,148
Gwinville	8-11-44	2,887	4,335	4,058	2,968	6,079	12,204	12,468	11,810	10,024	13,905	13,103	13,068	106,909	109,553
Langsdale	1-18-45	1,600	2,377	1,345	2,034	6,312	8,590	10,496	14,266	14,955	5,026	13,262	15,039	95,302	95,302
Brookhaven	7-8-43	1,001	906	1,023	976	996	678	771	1,784	6,219	9,899	10,753	11,592	46,598	65,899
Baxterville	11-18-44	2,940	4,101	9,798	7,263	2,701	1,416	2,542	9,957	3,232	3,348	2,502	2,493	52,293	53,340
Cary	9-16-41	935	845	576	0	0	511	394	1,130	855	2,826	1,120	1,445	10,637	52,945
Carthage Pt.	2-13-43	1,806	3,658	3,709	0	1,741	4,674	4,934	5,103	4,823	5,098	4,911	4,883	45,340	45,719
Flora	9-8-43	125	518	844	1,009	2,000	1,781	1,660	1,704	1,541	1,425	1,060	2,021	15,688	25,678
Fayette	8-14-45								2,580	5,201	5,686	5,134	5,338	23,939	23,939
Hub	3-3-45		481	0	9	381	1,341	1,387	846	2,561	3,973	3,651	6,954	21,584	21,584
Soso	3-1-45							407	482	483	468	485	346	2,671	2,671
Jackson	2-28-30*					400	500	700						1,600**	1,600**
Quitman	10-21-45					Produced only to fill limited storage. No production reported.									
1945 total		1,534,409	1,458,764	1,569,530	1,566,843	1,561,907	1,558,830	1,626,787	1,675,806	1,571,398	1,618,051	1,605,062	1,658,584	19,005,971	102,931,597
1944 total		1,348,988	1,230,699	1,293,797	1,243,421	1,270 945	1,302,987	1,371,798	1,402,687	1,411,552	1,487,474	1,512,997	1,543,001	16,420,346	83,925,626

* Discovery date refers to gas production.
** Does not include estimated 20,000 barrels produced by various wells in previous years.
Note: Production figures from records of the Mississippi State Oil and Gas Board.

Table IX lists some of the other more significant wildcat tests drilled in 1945 which added much to subsurface information.

OIL PRODUCTION

Production by months for each of the oil and/or condensate producing fields in Mississippi is shown in Table X.

A comparison is offered of monthly production rate with each month of 1944.

EXPLORATION

Geophysical and core-drill exploration increased from 3,090 crew weeks in 1944 to 4,209 weeks in 1945, the maximum record for the state. The increase of 1,119 crew weeks is about equally divided between seismograph and gravity meter.

TABLE XI

	Core Drill	*Gravity*	*Magnetometer*	*Seismograph*	*Soil Analysis*	*Total*
January	25	117	3	247	0	392
February	23	97	4	210	0	334
March	27	91	4	212	0	334
April	25	93	4	208	0	330
May	30	132	5	252	0	419
June	25	111	3	195	0	334
July	29	109	0	192	0	330
August	35	136	0	229	0	401
September	29	110	0	183	0	322
October	32	122	1	229	0	384
November	39	97	4	176	0	316
December	35	101	4	173	0	313
Total 1945	354	1,316	33	2,506	0	4,209
Total 1944	155	882	43	1,980	39	3,090
Total 1943	54	299	28	819	0	1,200

Table XI gives a monthly record of crew weeks work by each method which was employed in Mississippi in 1945, and a comparative annual total for the 2 preceding years.

CONCLUSION

At the end of 1945 there were 17 wildcat operations active in Mississippi, 3 of which had recovered oil showings which were to be tested for productivity.

Roeser and Pendleton-Sohio Petroleum Company's Baker-Maier No. 1 in Adams County is located approximately 8 miles southeast of Natchez. This test has recovered oil showings in sidewall cores from Wilcox sands and also in conventional cores taken from the "Massive" sand. On initial production tests difficulty was being encountered in obtaining a water-free completion.

A second Adams County wildcat, the Phillips Petroleum Company's Davey No. 1, 8 miles northeast of Natchez, cored gas and oil showings in the "Massive" sand from 10,030 to 10,076 feet, but at end of the year no tests had begun.

In Greene County, the Humble Oil and Refining Company's Oscar Ware No. 1, 11 miles east of the Richton dome, had low-gravity oil showings in thin sand streaks of the Eutaw. Preliminary production tests have not been encouraging as to commercial significance.

The discovery of shallow oil production in the Delhi field, Richland Parish, Louisiana, has resulted in a lease play in west-central Mississippi which will undoubtedly lead to drilling of wildcat wells in the future. The Delhi oil comes from basal Tuscaloosa and upper Paluxy sands in an east-west band on the south flank of the Monroe uplift.

The first Cretaceous bed in this uplift area is the thin development of "Gas rock" which is underlain by truncated Cretaceous, Comanche, and Jurassic beds which dip south.

At the point of the Delhi field, the basal Tuscaloosa formation is wedging out against the impermeable "Gas rock." The question of whether "pinch-out" or minor local structure is the principal factor in this accumulation is debatable.

The Mississippi play has developed on the south and east flanks of the Sharkey Platform area; stratigraphic and geophysical exploration will follow in an attempt to isolate the truncation point of the various formations.

In general, it is anticipated that the wildcat drilling program in Mississippi will show a decline as a result of poor discovery rate shown for the past 2 years. During the inactive period a comparison of geophysical records on the successful and unsuccessful prospects may be made which will increase the accuracy of interpretation and allow for determination of the method or methods best suited for a particular geological province.

A number of problems related to stratigraphy have been recognized in Mississippi and the increasing amount of subsurface information is clarifying these problems.

The writer believes that there should be complete understanding of the geological relationships within the state before attempting the longer-range state-to-state correlations which would result in possible change in nomenclature.

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VOL. 30, NO. 6 (JUNE, 1946), PP. 1051-1052

GEOLOGICAL NOTES

HARBOLITE: A CARBONACEOUS HYDROCARBON[1]

CEVAT E. TASMAN[2]
Ankara, Turkey

In southeastern Turkey, close to the Irak border and near the village of Harbol, is an extensive deposit of asphalt which before the first World War was worked as coal. The material obtained was carried to Habur Su and thence carried to Musul on rafts called *keleks*. It was used as fuel on the steamboats plying between Musul, Bagdad, and Basra.

In 1930 the writer had an opportunity to visit the locality and, observing that, though it was rather hard and resembled coal, it emitted a bitumen odor on burning, he recorded the occurrence as asphalt. He visited the locality again accompanied by E. Cunningham-Craig in 1937 and Frederick G. Clapp in 1943. Each time there was a discussion whether the deposit was a coal or some kind of an asphalt. Simple analysis of the samples in 1938 gave the following results:

Specific gravity	1.33
Bitumen	27.0 %
Coke	40.6 %
Ash	30.8 %
Calorific value	5951.

	Percentage
Carbon	54.3
Hydrogen	5.0
Nitrogen	0.7
Sulphur	7.0
Ash	32.6
H_2O	0.4
	100.0

Recently it was decided to go into the matter a little more extensively and attempts were made at a more complete analysis of the material.

This revealed the fact that the average of many samples contained (A) 34 per cent bitumen and (B) 66 per cent residue. The detailed examination of (A) showed the following.

	Percentage
Petrolene and malthene	45
Asphaltene	45
Carbene	10
	100

[1] Manuscript received, April 20, 1946.

[2] M.T.A. Petrol Grubu Direktoru.

The residue was subjected to Fischer process distillation by Adbülhafiz Akmut who did the greater part of the analytical work. This gave a tarry product and coke. The latter was burned to obtain the inorganic material. The result of part (B) was the following.

	Percentage
Pyrobitumen	13.0
Water of decomposition	3.5
Coke and free coal	25.3
Inorganic material	44.6
Loss in form of gases, *etc.*	13.6
	100.0

The inorganic material was in turn analyzed by Miss Naime Sengir with the following result.

SiO_2	26.2
Al_2O_3	10.3
Fe_2O_3	8.7
CaO	30.0
MgO	6.5
Loss on ignition	15.9

Recapitulating all the analyses on the original sample gives the following result.

	Percentage
Petrolene and malthene	15.3
Asphaltene	15.3
Carbene	3.4
Pyrobitumen	8.6
Coal	16.7
Inorganic material	29.4
Water of decomposition	2.3
Loss	9.0
	100.0

This occurrence, which at the time of E. Cunningham-Craig's visit was named harbolite because of its peculiar luster, apparently has the extraordinary composition of containing all the hydrocarbon constituents varying from the lightest petrolenes and malthenes to pyrobitumen and coal.

The deposit is closely associated with a fault and has an average thickness of 14 meters. It is found in the upper part of the Gercüş formation (lower middle Eocene) close to the boundary of the Midyat limestone (middle Eocene). A few hundred meters north, another fault, a large overthrust, brings the Permo-Carboniferous and Triassic beds over the lower and middle Eocene.

The attitude of the adjoining strata is very steep, ranging from 45° to 85° and even overturned. It is suggested that the deposit, a carbonaceous and colloidal shale, absorbed the upward-migrating oil along the fault. With the subsequent earth movements, loss in volatile fractions occurred. The high pressures rearranged some of the hydrocarbon molecules into more complex molecules of higher molecular weight.

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DISCUSSION

GEOLOGICAL RECONNAISSANCE IN SOUTHEASTERN PERÚ[1]

H. E. PARSONS[2]
Lima, Peru

With reference to the article "Geological Reconnaissance in Southeastern Perú" by Victor Oppenheim, appearing on pages 254–264 of the February, 1946, issue of the *Bulletin*, the following comments are offered.

The writer has within the past year made a traverse of the Urcos-Quincemil highway, and a trip by foot and canoe from Quincemil, *via* Punquiri, to Maldonado. Opportunity was also had for aerial observation of the region.

To Oppenheim's brief remarks on the physiography of the region may be added the mention of a pronounced front range, formed of the sequence of highly folded red clays and hard sandstones which he terms "Quincemil beds."

Contrary to Oppenheim, who noted only the very general northwest-southeast trend of structure, this range has a distinct east-west trend where it is transected by the Rio Inambari in a steep, almost canyon-like valley. The same trend continues westward almost to the upper Rio Madre de Dios before the northwest-southeast structural trend is resumed in the somewhat higher range termed "Cadena de Pantiacolla" on the American Geographic Society map.

The village of Quincemil lies about 26 kilometers south of this front range in a broad depression partly filled with gold-bearing Pleistocene gravel terraces, now considerably dissected.

Issuing from its steep valley within the range, the Rio Inamabri assumes the characteristic braided pattern of piedmont streams. It flows without any marked valley through the lowland region to join the meandering Rio Madre de Dios.

For a careful description of the pre-Cambrian "Araza gneiss" noted by Oppenheim as the oldest occurrence of its kind in this section of the Andes, reference should be made to Douglas.[3]

Oppenheim also assigns to the pre-Cambrian his "Marcapata formation" composed of phyllites and mica schists. Comparison with Douglas (p. 315) suggests that these phyllites should correspond with the formation which Douglas describes as a contact metamorphosed phase of black shales of possibly Silurian age. Douglas (p. 317) traced the "gradually increasing signs of metamorphism" from Huracona (ref. Amer. Geogr. Soc. 1:1,000,000 map) down into the Marcapata valley. The writer, having observed along the highway just above and below the village of Marcapata, a very interesting transition zone from black shales to garnet mica schists, must concur with Douglas on this point.

In his "Hualla-Hualla" series, Oppenheim has included the unaltered phase of the aforementioned black slates, and also, it appears, a sequence of quartzites which Douglas (p. 314) assigns to the Devonian.

Regarding Cenozoic beds, the failure of Oppenheim to report any definite Cretaceous formations is curious, in view of the apparent similarity of the red clays of the "Quincemil beds" to the widespread Puca formation, which has been assigned to the Upper Cretaceous.

It is to be regretted that the brevity of Oppenheim's reconnaissance has prevented gathering of ampler information on this not unimportant point.

[1] Manuscript received, April 9, 1946.

[2] Field geologist, Socony-Vacuum Oil Company.

[3] J. A. Douglas, "The Geology of the Marcapata Valley in Eastern Perú with Appendix on the Graptolites from the Quitari Area, by O. M. B. Bulman," *Quar. Jour. Geol. Soc. London*, Vol. 89, pp. 325 *ff*.

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
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REVIEWS AND NEW PUBLICATIONS

* Subjects indicated by asterisk are in the Association library, and are available, for loan, to members and associates.

TECTONIC DEVELOPMENT OF THE AMERICAS TO FORM THE EAST RIM OF THE PACIFIC, BY HANS STILLE

REVIEW BY W. A. VER WIEBE[1]
Wichita, Kansas

Tectonic Development of the Americas to Form the East Rim of the Pacific, by Hans Stille. 77 pages with 28 illustrations. Published by Gebrüder Bornträger, Berlin (1942). Separate from the *Geotectonic Researches*, Publication No. 4. In German.

In this monograph the reader finds the latest and most penetrating analysis of the architecture of the western hemisphere. The continents and their appendages are divided into Archeo-America, consolidated in pre-Cambrian time; Paleo-America, consolidated in Silurian time; Meso-America, consolidated in Carboniferous time; and Neo-America, consolidated in Tertiary time. The nuclear regions are called Laurentia and Brazilia. The former includes the region from the Llano-Burnet uplift northward to the United States ranges in northern Canada as well as the parts of the continent between the Appalachians and the western Rockies. Similarly, Brazilia includes all of South America except the western Andes. The basis for this classification is the fact that no post-Algonkian alpine-type deformation has affected these vast nuclear regions.

The gradual additions of the folded strips which were swedged against this nuclear bulwark form the main thesis of the author. Caledonian folds appear on the east from Newfoundland to the Marathons. Variscan folds appear in the same general belts but also affect the western part of the continent from Mexico to British Columbia. Alpine folding affected only the western part of the continent up to a line marked by the boundary between the Great Basin and the Colorado plateaus and the overthrust belts in western Wyoming and western Montana. Thus, the Nevadian and the overthrust elements of the Laramide revolution are sharply differentiated from the rest of the Laramide belt.

The foregoing summary is familiar to most of our members, but the details and especially the very illuminating maps and diagrams help to bring the facts into sharp focus. The author then takes up the Antillean region and the South American continent. It is here that our members will find the greatest reward for some difficult reading. The Andean folding is divided into the Hercynian portion, the Laramide portion, and three later stages during the post-Cretaceous history of the continent. The maps and diagrams which go with this portion are particularly valuable. There is abundant evidence that Hans Stille has had access to all the literature on this part of the globe and that he has digested even the latest data to make his story complete. He devotes considerable space to the theorem of migration of orogenies. He also presents some interesting summaries regarding the concomitant igneous intrusions and extrusions. He shows that great igneous activity was characteristic of the Nevadian revolution in North America, but that the Andes are characterized especially by Hercynian intrusions.

The Antillean region is the most complicated area and partakes of the orogenies in the other two areas. Here, again, the maps are most valuable in giving the reader a quick picture of the complicated history of that part of the western hemisphere.

[1] Professor of geology, University of Wichita. Review received, April 22, 1946.

STRATIGRAPHY OF THE GOLDEN-MORRISON AREA, JEFFERSON COUNTY, COLORADO, BY L. W. LEROY

"Stratigraphy of the Golden-Morrison Area, Jefferson County, Colorado," by L. W. LeRoy. *Quar. Colorado School of Mines*, Vol. 41, No. 2 (Golden, April, 1946). 115 pp., 23 figs., 11 pls. Price, $1.50.

Professor LeRoy's report on the stratigraphy of the Golden-Morrison area, in the April issue of the School of Mines *Quarterly*, discusses the sedimentary section exposed along the foothills belt in Jefferson County, 13 miles west of Denver, Colorado.

Lithologies, formational relationships, and outstanding characteristics of the major lithic units are presented. Graphic representations of the formations are given with the intention of familiarizing the reader with the stratal sequence. Photographs of stratigraphic control points are given and are correlated with the graphic sections.

The discussion is purely stratigraphic and was carried out with two major purposes in mind: (1) to establish a stratigraphic section that will serve as control for future structural investigations of the area, and (2) to create more interest in studies of Front Range stratigraphic detail.

A number of newly defined stratigraphic units appear for the first time in the literature.

The sediments involved in the study range from Upper Pennsylvanian to Lower Tertiary. The minimum total thickness of this sequence is approximately 10,500 feet.

The report is illustrated by photographs of outcrops, photomicrographs of rock samples and numerous detailed stratigraphic sections. A list is appended, giving more than 50 references to other reports on the geology of the region.

RECENT PUBLICATIONS

AFRICA

*"The Relation of the Main Peneplain of Central Africa to Sediments of Lower Miocene Age," by Frank Dixey. *Quar. Jour. Geol. Soc. London*, Vol. 101, Nos. 3–4 (London, February 28, 1946), pp. 243–53.

ALASKA

*"Geology of Alaska Naval Reserve," by William T. Foran. *Oil Weekly*, Vol. 121, No. (Houston, Texas, May 6, 1946), International Section, pp. 35–36; 48.

COLORADO

*"Stratigraphy of the Golden-Morrison Area, Jefferson County, Colorado," by L. W. LeRoy. *Quar. Colorado School of Mines*, Vol. 41, No. 2 (Golden, April, 1946). 115 pp., 23 figs., 11 pls. Price, $1.50.

CUBA

*Geology and Paleontology of Central Camaguey, Cuba, by Aart van Wessem. 91 pp., 3 pls. of fossils, 3 figs. 9.25×12 inches. Paper covers. J. van Boekhoven, Utrecht, Amsterdam, Netherlands.

ENGLAND

*"The Carboniferous Rocks of the Edale Anticline, Derbyshire," by Robert George Spencer Hudson and Geoffrey Cotton. *Quar. Jour. Geol. Soc. London*, Vol. 101, Nos. 401–2 (Longmans, Green and Company, Ltd., 43 Albert Drive, S. W. 19, London, October 30, 1945), pp. 1–36; 2 tables, 3 figs.

*"Intraformational Contorted Rocks in the Upper Carboniferous of the Southern

Pennines," by Fred Wolverson Cope. *Ibid.*, Nos. 403–4 (February 28, 1946), pp. 139–76, 30 figs.

GENERAL

"Bibliography of North American Geology 1942 and 1943," by E. M. Thom. *U. S. Geol. Survey Bull. 949* (1946). 460 pp. Sold by Supt. Documents, Govt. Printing Office, Washington 25, D. C. Price $0.70.

"Glacial Map of North America." *Geol. Soc. America Spec. Paper 60* (New York, 1946). Part 1 is the map in 2 sheets, which together measure 79×52 inches. Scale, 1 inch equals 72 miles. In 23 colors. Major topographic features shown by form lines on land and on sea floor. 150 footnotes printed on face of map. Several inset maps, including one showing distribution of loess in central U. S. Part 2 is a 40-page pamphlet containing explanatory notes and selected bibliography of North American glacial geology. Geological Society of America, 419 West 117th Street, New York 27, N. Y. Price. $2.00.

"Bibliography of Seismology No. 18, Items 5935–6046, July to December, 1945," by Ernest A. Hodgson. *Pub. Dominion Observatory, Ottawa*, Vol. 13 (1946), pp. 295–315. Canada Dept. Mines and Resources, Ottawa. Price, $0.25.

GREAT BRITAIN

*"The Geological Results of the Search for Oilfields in Great Britain," by George Martin Lees and Alfred Harold Taitt. *Quar. Jour. Geol. Soc. London*, Vol. 101, Nos. 403–4 (London, February 28, 1946), pp. 255–317; 5 pls., 10 tables, 13 figs.

GULF COASTAL PLAIN

*"Geological Investigation of the Alluvial Valley of the Lower Mississippi River," by Harold N. Fisk. 78 pp., frontispiece in colors, 80 figs., 11 tables, 33 pls. 9×12 inches. Paper covers. Dated December 1, 1944. Mississippi River Commission, Vicksburg, Mississippi. Price, $6.00.

MIDDLE EAST

"Oil in the Middle East," by G. M. Lees. *Royal Central Asian Jour.* (Billing and Sons Ltd., Gulford and Esher, London, January, 1946). 14 pp., 4 figs.

PHILIPPINES

*"Philippines Oil Development," by H. Foster Bain. *Oil Weekly*, Vol. 121, No. 10 (Houston, May 6, 1946), International Section, pp. 16–24; 7 photographs, 1 map.

RUMANIA

*"Notes on the Geology of the Southern Rumanian Oil District with Special Reference to the Occurrence of a Sedimentary Laccolith," by J. F. M. de Raaf. *Quar. Jour. Geol. Soc. London*, Vol. 101, Nos. 401–2 (London, October 30, 1945), pp. 111–34; 5 pls., 1 table, 16 figs.

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Burton E. Ashley, W. E. McHugh, W. A. Ver Wiebe
Frank Karr Fisk, Dallas, Tex.
Eugene McDermott, Lewis W. MacNaughton, T. K. Knox
Howard Luckett Franques, Lafayette, La.
M. U. Broussard, M. A. Reasoner, H. C. Igau

John Robert Hayes, Houston, Tex.
Glenn E. Bader, Wilton W. Andrews, Jack J. Flowers
Richard Marion Holland, Houston, Tex.
Harry Kilian, Don G. Benson, Cecil V. Hagen
Moses Melville Johnson, Denver, Colo.
Warren O. Thompson, James H. Turner, D. E. Lounsbery
Frederick Anderson Killer, Edmonton, Alta., Canada
F. G. Fox, W. P. Hancock, G. C. Beard
Elmer Lawrence Lucas, Norman, Okla.
Charles E. Decker, V. E. Monnett, C. G. Lalicker
Charles Bell Newmarch, Calgary, Alta., Canada
J. D. Weir, M. B. B. Crockford, R. L. Augenthaler
Hilmar Odum, Charlottenlund, Denmark
Albert Gregersen, Ralph O. Rhoades, C. W. Flagler
C. Wayne Sellon, Odessa, Tex.
Philip D. Larson, L. E. Patterson, Jr., R. L. Kidd
James William Thompson, Tulsa, Okla.
R. B. Rutledge, C. G. Lalicker, I. Curtis Hicks
Arno Paul Wendler, Houston, Tex.
Dave P. Carlton, S. R. Allen, P. H. O'Bannon
George York Wheatley, Montrose, Calif.
Art R. May, James B. Anderson, J. E. Matter

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Byron John Chronic, Jr., Lawrence, Kan.
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Garniss Hearfield Curtis, Ventura, Calif.
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Charles Richmond Grice, Fort Worth, Tex.
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Robert John Hamilton, Calgary, Alta., Canada
Leslie M. Clark, H. Donald Curry, James Campbell Scott
John Blythe Halton Henderson, Dallas, Tex.
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Henry C. Hobbs, Longmont, Colo.
A. W. Cullen, Warren O. Thompson, A. E. Brainerd
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Robert James Moffatt, Fort Worth, Tex.
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Garnet William Oliver, Tyler, Tex.
S. W. Blanchard, C. A. Mix, H. L. Burchfiel
Perry Fredrick Sollars, Houston, Tex.
J. A. Hord, Harold L. Williams, Olin G. Bell

Thomas Francis Taylor, Houston, Tex.
J. M. Vetter, G. J. Smith, P. A. Meyers
Norman Francis Williams, Norman, Okla.
V. E. Monnett, Charles E. Decker, C. G. Lalicker

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Peter Henry Gardett, Los Angeles, Calif.
James C. Kimble, E. L. De Maris, Frank B. Carter
Charles William Seedle, Jackson, Miss.
Julius William Schmotzer, K. K. Spooner, J. B. Means, Jr.
Sherman Alexander Wengerd, Wichita Falls, Tex.
R. E. Shutt, Sherwood Buckstaff, Ward C. Bean
Thomas Goodman Wright, Wichita, Kan.
L. W. Kesler, Delbert J. Costa, E. P. Philbrick

ADDITIONAL APPLICATIONS APPROVED

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R. B. Hutcheson, E. H. Burtner, Cordell Durrell
Henry Nason Kinney Brookings, Shreveport, La.
Joseph Purzer, Charles J. Hoke, Laurence Lees
Jack Harvey Brown, Wichita, Kan.
John W. Inkster, T. C. Peters, Everett L. Bradley
Roger Harrison Cowie, Rolla, Mo.
Garrett A. Muilenburg, George A. Thiel, C. H. Summerson
Lester Raymond Dawson, Jr., Houston, Tex.
George D. Stevens, W. L. Goldston, W. Harlan Taylor
Plinio de Lima, Sao Paulo, Brazil, S. A.
J. Elmer Thomas, F. L. Aurin, Walter R. Berger
Cyril Clayton Denny, New Orleans, La.
Robert R. Copeland, Jr., H. V. Howe, Max Bornhauser
Edward Auld Dodson, San Antonio, Tex.
Hal P. Bybee, Harry H. Power, Fred M. Bullard
Ellsworth William Fort, Lake Charles, La.
O. Wilhelm, J. M. Bugbee, E. R. Scott
Alvin Louis Frericks, Houston, Tex.
Hillord Hinson, Howard R. Born, J. C. Montgomery
Louis W. Gardner, Pittsburgh, Pa.
R. O. Rhoades, Wendell B. Gealy, L. L. Nettleton
Francis Alex Gibson, Haifa, Palestine
N. E. Baker, Dave P. Carlton, Glenn E. Bader
Samuel Stephen Goldich, College Station, Tex.
F. E. Turner, J. Fred Smith, Jr., G. A. Berg
William Roy Hogan, Jr., Tyler, Tex.
A. C. Wright, Howard H. Lester, G. W. Pirtle
Finley W. Holbrook, Houston, Tex.
R. A. Weingartner, Shirley L. Mason, H. E. Menger
William Aultin Kelley, East Lansing, Mich.
R. L. Belknap, George V. Cohee, Kenneth K. Landes

Virginia Harriett Kline, Urbana, Ill.
M. M. Leighton, L. E. Workman, Alfred H. Bell
Lester Lloyd Logue, Dallas, Tex.
Eugene McDermott, Lewis W. MacNaughton, Willis G. Meyer
Ludwig Mazurczak, Bern, Switzerland
L. Vonderschmitt, W. Bernoulli, C. Wiedenmeyer
Winnie McGlamery, University, Ala.
Walter B. Jones, John R. Sandidge, H. B. Stenzel
John Herhold Murrell, Dallas, Tex.
John S. Ivy, J. Elmer Thomas, H. J. Gruy
Laurence Earl Nugent, Jr., Fort Worth, Tex.
D. G. Stookey, Edwin M. Rowser, Joseph H. Markley, Jr.
Hilary Igor Ortynski, Ankara, Turkey
Cevat E. Tasman, W. T. Wyszynski, Joseph Zaba
William Charles Rasmussen, Austin, Tex.
H. Gordon Damon, W. O. George, Wilson M. Laird
James E. Robert Sheeler, Iowa, La.
O. Wilhelm, E. R. Scott, J. M. Bugbee
Lorenz Ira Shock, San Angelo, Tex.
Leo R. Newfarmer, A. E. McKay, Lee B. Park
Thomas F. Thompson, Diablo Heights, Panama Canal Zone
C. W. Hoffer, Eliot Blackwelder, Siemon W. Muller
Robert Orion Vernon, Tallahassee, Fla.
H. G. Walter, Robert B. Campbell, H. A. Sellin
Rudolph Frederick Weichert, Jr., New York, N. Y.
Bela Hubbard, Winthrop P. Haynes, Douglas A. Greig
Eldred Dewey Wilson, Tucson, Ariz.
Edwin D. McKee, Ian Campbell, John H. Maxson
Ralph Woodrow Wilson, Houston, Tex.
Don G. Benson, George I. McFerron, Olin G. Bell
Kermit Thomas Woodman, Wichita, Kan.
W. A. Ver Wiebe, N. D. Clark, E. A. Huffman

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Malcolm Evan Baker, Dallas, Tex.
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William Sherman Butcher, Woods Hole, Mass.
Parker D. Trask, Kirtley F. Mather, Jack L. Hough
Maxwell Gary Capen, Bakersfield, Calif.
H. E. Harrington, John T. Isberg, A. R. Kerr
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Beno Gutenberg, John H. Maxson, J. P. Buwalda
Robert Wesley Eaton, Tyler, Tex.
J. Archer Culbertson, A. K. Tyson, Malcolm D. Bennett, Jr.
Leroy Esterak, Hugoton, Kan.
T. K. Knox, A. B. Patterson, Bernard R. Hasbrouck
Leila Lisette Eyoub, Amarillo, Tex.
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Harold Lawrence Fothergill, Los Angeles, Calif.
James Gilluly, E. K. Soper, Cordell Durrell

Hugh N. Frenzel, Carlsbad, N. Mex.
Walter C. Warren, L. Murray Neumann, Norman D. Newell
Edward Andrew Martin Fulmer, Guelph, Ont., Canada.
M. B. B. Crockford, J. D. Weir, G. M. Furnival
Gerald Robert Gaige, Mount Vernon, Ill.
Rex P. Grant, Milton Hruby, Fred H. Moore
Byron Bennett Gibbs, Shreveport, La.
L. H. Meltzer, A. Safonov, J. Edward Lytle
Jacques Guillaumin, Jr., New York, N. Y.
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Francis Ayers Hale, Bakersfield, Calif.
Cecil H. Green, Phil P. Gaby, A. J. Solari
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E. K. Soper, U. S. Grant, James Michelin
George Norris Johnson, Shreveport, La.
Van D. Robinson, S. M. Aronson, G. W. Gulmon
Harold E. Jones, Houston, Tex.
William C. Ikins, F. L. Whitney, Leland W. Ashmore
Ralph Louis Langenheim, Jr., Tulsa, Okla.
A. N. Murray, R. A. Brant, R. V. Hollingsworth
Robert Irving Levorsen, Los Angeles, Calif.
E. B. Noble, E. K. Soper, James Gilluly
Milton Edwin Loy, Bakersfield, Calif.
W. D. Kleinpell, Mason L. Hill, John H. Beach
Lynne C. McKee, Tampa, Fla.
H. G. Walter, Coe S. Mills, George H. Hansen
Marion Dale Myers, Dodge City, Kan.
W. C. Imbt, C. T. Jones, John G. Bartram
Frank Carter Osment, Shreveport, La.
Elmer M. Rice, E. W. Price, John G. Watson
Carl Frederick Pampe, Olney, Ill.
Darsie A. Green, Kenneth G. Boling, Harold R. Wanless
Robert Evan Pancake, Shreveport, La.
Richard Freed, G. E. Tash, G. W. Schneider
Benjamin John Petrusek, Houston, Tex.
Fred M. Bullard, F. L. Whitney, L. C. Snider
James Edwin Ramsay, Kenedy, Tex.
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Kenneth George Redman, Lawrence, Kan.
L. R. Laudon, John C. Frye, M. L. Thompson
William Eastburn Richardson, Tyler, Tex.
G. T. Buskirk, C. I. Alexander, Forrest W. Hood
Clark A. Roach, Wichita, Kan.
Harold O. Smedley, W. E. McHugh, E. A. Huffman
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Carl E. Moses, Kenneth K. Landes, Lewis B. Kellum
Samuel Eberle Sims, Houston, Tex.
Jo Pat Black, Shirley L. Mason, Donald E. Mathes
Bill Curtis Tucker, Tulsa, Okla
F. A. Melton, V. E. Monnett, Charles E. Decker
Walter Hillman Walne, Jr., Midland, Tex.
John I. Moore, W. T. Thom, Jr., P. D. Moore

Kenneth Wilson Webb, Wichita, Kan.
A. R. Denison, Dollie Radler Hall, C. G. Lalicker
Norman Neal West, Austin, Tex.
F. L. Whitney, Fred M. Bullard, L. C. Snider

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Allen Francis Agnew, Iowa City, Iowa
F. W. DeWolf, Don L. Carroll, H. W. Scott
Arthur Ernest Feldmeyer, Los Angeles, Calif.
Art R. May, Frank Ittner, Harry A. Sprague
Frank Johnson Gardner, Alice, Tex.
Hal P. Bybee, Fred M. Bullard, E. H. Sellards
George Cecil Hardin, Jr., Houston, Tex.
M. T. Halbouty, E. J. Smith, Jr., W. H. Hass
Fawzi Iskander, New York, N. Y.
F. L. Fournier, K. D. White, E. J. Foley
Russell MacGregor Jeffords, Lawrence, Kan.
Wallace Lee, M. L. Thompson, L. R. Laudon
Holland C. McCarver, Dallas, Tex.
R. S. McFarland, R. A. Stehr, Cecil H. Green
Johnny Bob Moorhead, Wichita Falls, Tex.
Donald Kelly, John A. Kay, T. F. Petty
Ralph Emerson Smith, Fort Worth, Tex.
Charles E. Decker, C. G. Lalicker, V. E. Monnett
Alvin Raymond Winzeler, Wichita, Kan.
Kenneth J. Reid, Delbert J. Costa, Lee H. Cornell

SELECTIVE SERVICE ACT EXTENDED (OSP BULLETIN 31)

The following paragraphs from *OSP Bulletin 31*, issued by director M. H. Trytten, of the Office of Scientific Personnel, under date of May 22, are brought to the attention of the members by M. Gordon Gulley, chairman of the Association national service committee, in an attempt to give wide distribution to this information, although there may be changes in the status of the Selective Service Act before this notice appears.

Out of the confusion of the last few days regarding Selective Service, at least a few items have definitely emerged. The Selective Service Act has been extended to July 1, exempting fathers and youths below the age of twenty. The Senate Military Affairs Committee reported out an extension of the Selective Service Act for one year on April 11.

With regard to the present situation, it appears that the provisions of Local Board Memorandum 115 and Memorandum 115-M will apply to the new age bracket, 20–29, inclusive. *It is strongly advised*, however, that employers of those registrants who are newly vulnerable to Selective Service, ages 26–29, inclusive, execute immediately Selective Service Form 42-A (Special-Revised), requesting deferment. These should be submitted at once to George S. Bailey, OSRD, 1530 P Street, N.W., Washington, D. C. It must be borne in mind that the pressure on local boards to induct every available registrant will be sharply increased and employers must not fail to present every case adequately.

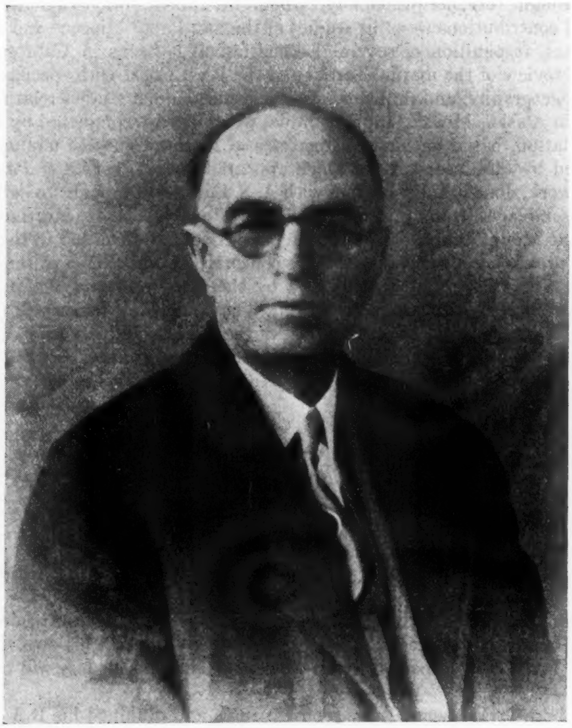
BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6 (JUNE, 1946), PP. 1065-1067

MEMORIAL

BRUCE LAWRENCE CLARK

(1880–1945)

Professor Bruce L. Clark of the University of California, and for eighteen years a member of the American Association of Petroleum Geologists, died in Berkeley, California, on September 23, 1945, after a long illness. He had been a member of the staff in paleon-



Bruce Lawrence Clark

tology at the University from 1910 until illness forced his retirement as associate professor and as curator of invertebrates in the last year of his life.

Born in Humboldt, Iowa, on May 29, 1880, he received his early education in that state. When his family ultimately settled in California, he attended Pomona College, where he graduated in 1908. He then matriculated at the University of California and received an M.A. degree the following year. It was here that he was attracted to what became

his principal scientific interest, invertebrate paleontology, through the influence of Professor John C. Merriam. He first assisted in summer field work and later became an instructor in his chosen subject. He received his Ph.D. degree in 1913.

During his many years of service he and his students made substantial contributions to the Tertiary invertebrate faunas of the Pacific Coast. He was a frequent contributor to the scientific sessions of the Cordilleran section of the Geological Society of America and of the Pacific section of the American Association of Petroleum Geologists. An industrious and hard worker he came to know the fossil invertebrates of the Cenozoic of this region as few knew them. Professor Clark was often requested by petroleum companies to identify fossil material and to render opinions as to the age and relationships of particular faunal horizons. The large and valuable collections in invertebrate paleontology now at the University were brought together principally through his efforts. Among his more important paleontological contributions were his studies of the San Pablo Miocene and San Lorenzo Oligocene faunas, recognition of several Eocene faunal horizons in California, and his comprehensive review of the marine Tertiary of the West Coast with special regard to its sequence, paleogeography, and problems of correlation. Faunal studies relating to regions farther afield, in Alaska, Mexico, and Colombia, were likewise conducted by him. Speciation and correlation, based on his investigations of marine Cenozoic mollusks, were recently discussed by him in an article which appeared in the *Journal of Paleontology*, in 1945. His last work, done in collaboration with A. S. Campbell, brought to light significant radiolarian assemblages from the Tertiary of California. Clark's stratigraphical and faunal studies at Mount Diablo and elsewhere in the Coast Ranges led to the publication of his thought-provoking but debatable views concerning the tectonics of these regions.

Professor Clark will be long remembered by the many students who received their training in invertebrate paleontology under him. These men and women will always retain an affectionate regard for him, in part because of the honesty and integrity of the man, in part also because he was capable of arousing in them a lasting enthusiasm in the science of their choice.

CHESTER STOCK

CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA
April 10, 1946

DANA HOGAN

(1890–1945)

Dana Hogan, a member of the Association since 1927, died in Los Angeles on December 14, 1945. Dana was a successful geologist and oil producer in his own right. He was widely known, loved, and respected by all who knew him and his loss will be keenly felt by all.

Dana was born in Minneapolis on June 26, 1890, and obtained his B.A. degree from the University of Wisconsin in 1912. His first geological work took him to the Rocky Mountain area where he remained until going to California in 1923. He was associated with E. L. Doheny interests until 1930 when he entered business for himself.

Dana is given credit for discovering the Mountain View oil field in 1933, and the Hogan Petroleum Company which he organized and of which he was president until his death obtained its principal production from properties in that field. Properties in many other fields were acquired and developed by the company in other important fields in California and Hogan owned separately other producing properties in Wyoming.

Dana took a keen interest in oil-industry affairs and public relations and organized the San Joaquin Valley Oil Producers Association and was its president for many years. He was a member of the Petroleum War Council during the war and was a director of the Independent Petroleum Association of America, the American Petroleum Institute, and the Western Oil and Gas Association. In addition, he was a member of the American Institute of Mining and Metallurgical Engineers and many clubs and social organizations. During World War I, he served as naval aviator with rank of Lieutenant (junior grade).

J. R. Pemberton

Los Angeles, California
April 19, 1946

BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS
VOL. 30, NO. 6, (JUNE, 1946), PP. 1068-1076

AT HOME AND ABROAD

CURRENT NEWS AND PERSONAL ITEMS OF THE PROFESSION

JOHN W. BUTLER, JR., is assuming new duties in Caracas, Venezuela, as chief geologist for the Phillips Venezuelan Oil Company, after almost 10 years of work in Colombia, the first two with the Colombian Government and the remainder with the Texas Petroleum Company. His address is Phillips Venezuelan Oil Company, Apartado 1031, Caracas, Venezuela.

The Tulsa Geological Society held a field trip in eastern Oklahoma, May 11, to study the geologic section covering the Marmaton, Cherokee, Morrow, Chester, Meramec and Boone formations. The leaders were L. E. FITTS and R. A. BRANT.

VERNER JONES, recently released from military service after having the rank of Lieutenant Colonel, has been in Spain in the interests of his employer, the Socony-Vacuum Oil Company, 26 Broadway, New York City.

Having served in the Southwest Pacific Area since his entry into the United States Army in Java in December, 1941, and having recently resigned his commission as Lieutenant Colonel in the Corps of Engineers in Java, R. H. HOPPER, formerly of Pasadena, California, is again at work with the Nederlandsche Pacific Petroleum Maatschappij at Kebon Sirih 44, Batavia, Java.

G. RUSSELL SPARENBERG is geologist with the Houston Natural Gas Corporation, assisting HILLARD W. CAREY, production engineer, with the mapping of wells, preparation of technical reports and indexing of geological data pertaining to gas fields in the Texas Gulf Coast area. Prior to his employment with the Houston Natural, Sparenberg was a lieutenant in the Navy. During his years of service from October, 1942, to January, 1946, he was cited for meritorious achievement during the Normandy invasion and he also participated in the invasion of Leyte.

GEORGE W. WHITE, professor of geology at the Ohio State University, has been appointed State geologist for Ohio. He succeeds WILBER STOUT, who retired May 1 after serving 18 years as State geologist, and nearly 34 years with the Geological Survey of Ohio. White has been at Ohio State University since 1941. From 1926 to 1941 he was a member of the staff of the geology department of the University of New Hampshire.

The First Annual Field Conference of the Wyoming Geological Association will be held in the latter part of July or first part of August in central and southeastern Wyoming. Anyone wishing further announcements should notify ROSS L. HEATON, Box 1346, Casper, Wyoming, giving his name and address and stating, if possible, whether he definitely expects to attend.

STANLEY C. HEROLD, petroleum geologist and production engineer, announces the resumption of consulting practice specializing in reservoir geology and engineering at 1330 Ethel Street, Glendale 7, California.

CHESTER STOCK, professor of paleontology at the California Institute of Technology, Pasadena, was elected a member of the American Philosophical Society on April 19, 1946.

About 120 geologists registered for the field trip of the Utah Geological Society to the Henry Mountains. This was a camping trip, everything being furnished except bed rolls.

It lasted 2½ days, beginning at Hanksville, Utah, where the excursionists gathered on the afternoon and evening of Friday, May 10. CHARLES B. HUNT, regional geologist of the Geologic Branch of the United States Geological Survey at Salt Lake City, and the guide for this trip, had charge of a resurvey of the Henry Mountains region made famous by G. K. Gilbert. Hunt is also author of the guide-book which gives the essentials of the work done. It contains 50 pages and 12 illustrations including a general geologic map of the Henry Mountains and other selected illustrations from his survey. This advance publication is made with the permission of the director of the Geological Survey. To those who did not make the trip, the guide-book is available at $1.50 per copy and may be obtained from Professor GEORGE C. SELFRIDGE, Department of Geology, University of Utah, Salt Lake City, Utah. Although the Henry Mountains are of primary interest to "hard-rock" geologists, this trip attracted many petroleum geologists interested in the structure and stratigraphy of southeastern Utah.

OTTO DREHER, of Wassenaar, Holland, died December 9, 1945, at the age of 57 years. He was for many years a geologist with the Royal Dutch Shell at The Hague. He became a member of the A.A.P.G. in 1921.

DONALD L. NORLING, formerly with Devonian Oil Company in Fort Worth, Texas, has accepted a position as instructor of geology at Ohio State University, Columbus, Ohio. He has done commercial work for the past 9 years.

R. D. BUCK, with the Schlumberger Well Surveying Corporation in Shawnee, Oklahoma, gave a talk on "Empirical (Qualitative) versus Mathematical (Quantitative) Methods of Examining Electric Logs" before the Shawnee Geological Society, May 2.

The following officers of the Shawnee (Oklahoma) Geological Society were elected for the coming year: president, DELBERT F. SMITH, Oklahoma Seismograph Corporation; vice-president, HENRY A. CAMPO, Atlantic Refining Company; secretary-treasurer, MARCELLE MOUSLEY (re-elected), Atlantic Refining Company, Box 169, Shawnee, Oklahoma.

DISTINGUISHED LECTURE TOUR

HORACE G. RICHARDS, associate curator of geology and paleontology of the Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania, appeared before seven of the affiliated societies during the month of May in a lecture tour sponsored by the distinguished lecture committee. Richards discussed the "Subsurface Stratigraphy of the Southeastern Atlantic Coastal Plain."

He appeared before the following societies.

May 13	Houston Geological Society, Houston, Texas
14	East Texas Geological Society, Tyler, Texas
15	Dallas Geological Society, Dallas, Texas
16	North Texas Geological Society, Wichita Falls, Texas
17	Oklahoma City Geological Society, Oklahoma City, Oklahoma
20	Tulsa Geological Society, Tulsa, Oklahoma
21	Kansas Geological Society, Wichita, Kansas

HOUSTON GEOLOGICAL SOCIETY STUDENT AWARDS

At a special evening meeting of the Houston Geological Society at the Texas State Hotel, Houston, Texas on May 6, papers were presented by two students of the geological department and two students of the petroleum engineering department of the Agricultural and Mechanical College of Texas. The two students chosen to be sponsored by the Society in their applications for associate memberships to the American Association of Petroleum Geologists and the title of the paper which was read by each are: PAUL GRA-

HAM, geologist, "Problem of Paleozoic Stratigraphy in the Chinati Mountains," and JAMES W. AMYX, petroleum engineer, "Underground Storage of Natural Gas." This is the first annual Student Award to be sponsored by the Houston Geological Society since the spring of 1941. It was interrupted for the intervening years due to conditions resulting from the World War. R. C. BOWLES, vice-president of the Standard Oil Company of Kansas, is chairman of the Student Awards committee.

JOHN B. KERR, has moved his headquarters from Little Rock, to Foreman, Arkansas, effective June 1. During the past 3 years he was associated with the United States Bureau of Mines as mining engineer, in a bauxite exploration project, with headquarters at Little Rock. More recently he spent a short time in West Texas, as geologist with the Atlantic Refining Company, resuming his consulting practice in 1946.

C. W. SANDERS, chief geologist for the Danciger Oil and Refining Company, has returned to Fort Worth, Texas, after an extensive field trip covering portions of California, Wyoming, and Colorado.

EUGENE L. MAXWELL, of White City, Kansas, has joined the geological staff of the Lion Oil Company, El Dorado, Arkansas. Maxwell was released from service on February 1, after having served since December, 1942, as ensign and lieutenant (j.g.).

LOUIS MARTIN ROBERT RUTTEN, professor of geology and paleontology, University of Utrecht, died on February 11, at the age of 62 years.

AMADEUS WILLIAM GRABAU, professor of paleontology, National University, Peiping, China, and chief paleontologist of the Geological Survey of China, died on March 20, 1946, at the age of 76 years. He went to China in 1920 at the invitation of the Chinese Government.

JOHN O'KEEFFE, JR., is now employed by the Western Gulf Oil Company in Bakersfield, California.

E. F. BOEHMS, recently with the Texas Pacific Coal and Oil Company, Breckenridge, Texas, is district geologist for the American Trading and Production Corporation, Abilene, Texas.

The first South American Petroleum Congress is to be held in Lima, Peru, the first week in March, 1947. Ten groups of subjects are listed in the preliminary program: (1) Geology and Petroleum Exploration; (2) Petroleum Production; (3) Chemistry of Petroleum; (4) Petroleum Refining; (5) Transportation and Storage; (6) Consumption and Utilization of Petroleum Products; (7) Supply and Exchange of Fuels; (8) Hygiene in the Oil Industry; (9) Legislation and Economics; (10) Teaching in the Oil Industry. The Permian Section of the I. S. A. P. (South American Petroleum Institute), Box 889, Lima, Peru, or the executive committee of the I.S.A.P., Box 414, Montevideo, Uruguay, will be pleased to supply further information about the Congress.

WILLIAM C. KRUMBEIN has been appointed professor of geology at Northwestern University and will leave his present position with the Gulf Research and Development Company to take up his new duties in September. He will participate in development of geological work in the Northwestern Technological Institute, as well as in the teaching program in the College.

JOHN R. BALL, professor of geology and paleontology at Northwestern and for thirty years a member of the staff, will retire from the University at the end of the current academic year but expects to continue active geologic work.

The West Texas Geological Society, of Midland, Texas, sponsored a field trip to the Hueco and Franklin Mountain areas near El Paso, Texas, on Friday, May 31, and Saturday, June 1, 1946, to study pre-Permian formations. The group assembled in El Paso on the evening of Thursday, May 30. An instruction meeting and a discussion forum were held in the Crystal Ballroom of the Hilton Hotel at 8.00 P.M., under the leadership of LLOYD A. NELSON, of the geological department of the Texas College of Mines. SURCE J. TAYLOR was the field-trip committee chairman.

RENE POMEYROL is with the Service des Mines, Nouméa, Nouvelle Calédonie.

JOHN H. CRUMP has been released from activity duty with the Army and is now district geologist for North Louisiana and Mississippi with the Southwest Gas Producing Company, Inc., Monroe, Louisiana. Crump was a Lieutenant Colonel in the Air Corps. He was overseas 3½ years, including the Battle of the Bulge.

EUGENE M. BAYSINGER was released from active duty with the Army, Corps of Engineers, with the rank of First Lieutenant, on February 22. Baysinger was in service since 1942. He won two campaign medals, a victory medal, and the Philippine Liberation Ribbon, in 3½ years of service. He is now with The Texas Company at New Orleans, Louisiana.

SCHUYLER B. HENRY is with the Richmond Exploration Company, Tienda Honda a Puente No. 61, Caracas, Venezuela.

M. M. BARLOW, recently with the National Associated Petroleum Company, is now in the employ of the Kingwood Oil Company at Jackson, Mississippi.

Two geologists were recently elected to be members of the National Academy of Sciences: WILMOT HYDE BRADLEY and WENDELL PHILLIPS WOODRING, both of the United States Geological Survey.

CARLETON D. SPEED, JR., chief geologist for the Plymouth Oil Company, Sinton, Texas, has resigned. He is succeeded by W. W. LARUE, chief geophysicist and seismologist.

WILLIAM W. CLAWSON has been appointed chief geologist of the Magnolia Petroleum Company, Fort Worth, Texas, succeeding SHERIDAN A. THOMPSON, recently appointed vice-president in charge of exploration.

WILLIAM C. MACQUOWN has left the employ of the Magnolia Petroleum Company, San Antonio, Texas, and is now assistant professor of geology at the University of Kentucky, Lexington.

FRANK A. MORGAN, JR., is with the British-American Producing Company, Casper, Wyoming.

SUMNER T. PIKE, formerly a member of the United States Securities and Exchange Commission, Philadelphia, Pennsylvania, may be addressed at 2 Church Street, Lubec, Maine.

BOOKS—WAR VICTIMS

During the war, the libraries of half the world were destroyed in the fires of battle and in the fires of hate and fanaticism. Where they were spared physical damage, they were impoverished by isolation. There is an urgent need—now—for the printed materials which are basic to the reconstruction of devastated areas and which can help to remove the intellectual blackout of Europe and the Orient.

There is need for a pooling of resources, for coordinated action in order that the devastated libraries of the world may be restocked as far as possible with needed American publications. The American Book Center for War Devastated Libraries, Inc., has come into being to meet this need. It is a program that is born of the combined interests of library and educational organizations, of government agencies, and of many other official and non-official bodies in the United States.

The American Book Center is collecting and is shipping abroad scholarly books and periodicals which will be useful in research and necessary in the physical, economic, social and industrial rehabilitation and reconstruction of Europe and the Far East.

The Center cannot purchase books and periodicals; it must depend upon gifts from individuals, institutions, and organizations. Each state will be organized to participate in the program through the leadership of a state chairman. Other chairmen will organize interest in the principal subject fields. Cooperation with these leaders or direct individual contributions are welcomed.

What is needed.—Shipping facilities are precious and demand that all materials be carefully selected. Emphasis is placed upon publications issued during the past decade, upon scholarly books which are important contributions to their fields, upon periodicals (even incomplete volumes) of significance, upon fiction and non-fiction of distinction. All subjects—history, the social sciences, music, fine arts, literature, and especially the sciences and technologies—are wanted.

What is NOT *needed.*—Textbooks, out-dated monographs, recreational reading, books for children and young people, light fiction, materials of purely local interest, popular magazines such as *Time, Life, National Geographic, etc.*, popular non-fiction of little enduring significance such as Gunther's *Inside Europe*, Haliburton's *Royal Road to Romance, etc.* Only carefully selected federal and local documents are needed, and donors are requested to write directly to the Center with regard to specific documents.

How to ship.—All shipments should be sent PREPAID *via* the cheapest means of transportation to THE AMERICAN BOOK CENTER, C/O THE LIBRARY OF CONGRESS, WASHINGTON 25, D.C. Although the Center hopes that donors will assume the costs of transportation of their materials to Washington, when this is not possible reimbursement will be made upon notification by card or letter of the amount due. THE CENTER CAN NOT ACCEPT MATERIAL WHICH IS SENT COLLECT. Reimbursement can not be made for packing or other charges beyond actual transportation. When possible, periodicals should be tied together by volume. It will be helpful if missing issues are noted on incomplete volumes.

NEW GENERAL STAFF GROUP TO COORDINATE MILITARY, CIVILIAN RESEARCH PROJECTS

Creation of a Research and Developments Division as a top-level General Staff organization to coordinate Army research with the activities of industry and educational institutions was announced by Secretary of War Robert P. Patterson in a War Department Bureau of Public Relations press release dated May 2. Colonel Gervais W. Trichel, of the War Department Special Staff New Developments Division, was named as acting director.

In a memorandum to all War Department organizations outlining the Secretary of War's decision to create the new staff division, General Eisenhower stated that lessons learned in the war showed clearly the need for integration of all national resources in time of war. To this end, he stated, the Army "as one of the main agencies responsible for the defense of the Nation has the duty to take the initiative in promoting closer relation between civilian and military interests."

The Division has primary interest in the application of national scientific resources

to the solution of military problems. According to Edward L. Bowles, expert civilian consultant to the Secretary of War, who aided General Eisenhower in developing the plan for the new Division, the director will act as liaison between Army planning chiefs on one hand and industry and the universities and research laboratories on the other. Creation of the Division will result in the Army's coordination with existing civilian organizations in the development of new military techniques. Great civilian advances are foreseen as a result of much of the Army-sponsored research. Recognizing the abilities of civilian research groups, the War Department will from time to time put before industrial and scientific experts broad problems which will be dealt with along lines which the civilian organizations have found to be most likely of productivity.

O. G. McClain has resigned his position as chief geologist for the Southern Minerals Corporation in Corpus Christi, Texas, and has opened an office at 224 Nixon Building to do consulting geological work.

E. O. Bennett, James O. Lewis, and David G. Hawthorn have formed a partnership with the firm name of Petroleum Consultants, Houston, Texas. Their field includes petroleum and production engineering and geology.

William H. Strang has been appointed executive secretary of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers, as announced by Herbert F. Beardmore, chairman of the Division. Headquarters of the Division is in Dallas, Texas. Strang recently returned from four years of service with the Army Ordnance Department. He had the rank of Lieutenant Colonel.

E. W. Sisney has terminated his employment with the Cities Service Gas Company to accept a position with Harrington and Marsh, Amarillo Building, Amarillo, Texas.

Tom E. Folsom of Alhambra, California, is with Aguas Calientes, Rio Pachitea, Peru.

Ward C. Bean has retired to his new home on Lake Hamilton, near Hot Springs, Arkansas, after many years as geologist with the Shell Oil Company, Inc.

G. Frederick Shepherd has resigned as geologist for Wm. Helis and is engaged in private practice as consulting geologist. His address is 123 Maryland Drive, New Orleans, Louisiana.

Withers Clay, who has engaged in consulting work at Evansville, Indiana, for several years, is now at Largo, Florida.

Donald B. Eicher, who has been with the Standard Oil Company of Egypt at Cairo, may now be addressed at 3202 Home Avenue, Berwyn, Illinois.

G. W. Lepper is retiring from the service of the Ministry of Fuel and Power, Petroleum Division, London, and may be addressed at 62 Southborough Road, Bickley, Bromley, Kent, England.

V. Dale Martin has terminated his connection with the Foote Mineral Company to accept a position in Venezuela as manager of the land department for the Venezuelan Atlantic Refining Company at Caracas.

Katherine F. Greacen is leaving the Hunt Oil Company to become assistant professor of geology and geography and curator of the Greene Memorial Museum at Milwaukee-Downer College, Milwaukee, Wisconsin.

EUGENE HOLMAN, president of the Standard Oil Company (New Jersey), of New York City, addressed the graduating class of Hardin-Simmons University, Abilene, Texas, June 3. Holman graduated from Hardin-Simmons in 1916.

IAN COOK of the British American Oil Company, Calgary, gave a paper on "The Devonian Stratigraphy of Alberta" at a meeting of the Alberta Society of Petroleum Geologists, at Calgary, April 3.

L. L. SLOSS, associate professor of geology, Montana School of Mines, gave a lecture on "Devonian Stratigraphy of Montana" at a meeting of the Alberta Society of Petroleum Geologists, May 18. The lecture was illustrated with kodachrome slides.

VEI CHOW JUAN was married in Chicago on May 22 to Miss Haien-Fang Yolanda, daughter of Mr. and Mrs. Tao Yu Clarence Sun. Juan was with the Military Geology Unit of the United States Geological Survey during 1944–1945, and during the past year has been doing graduate work at the University of Chicago.

GERALD A. WARING, of the United States Geological Survey is stationed at Minot, North Dakota, for the remainder of the year, engaged in irrigation studies in the Missouri River Basin.

D. J. DOEGLAS was engaged, during the war years, in an extensive research program on sedimentary petrology in the laboratory of the N. V. de Bataafsche Petroleum Maatschappy in Amsterdam. After visiting the oil centers of the Shell, he will return to the Netherlands to continue his sedimentary petrology work in a new connection after September 1, at the agriculture university in Wageningen. His address is Shell Oil Company, Inc., Box 2099, Houston, Texas; after September 1, it will be Landbouwhoogeschool, Afdeeling Regionale Geologie en Bodemkunde, Wageningen, Netherlands.

WILLIAM WIRT HENRY, formerly president of the Continental Corporation, and vice-president of the Atlantic Oil Corporation, announces the opening of offices for the general practice of consulting geology, specializing in oil and gas investments, royalties, leases, and drilling blocks, estimates of reserves, appraisals, and valuations. The address is 634 Kennedy Building, Tulsa, Oklahoma.

HARRY W. ANISGARD is with the Creole Petroleum Corporation, Apartado 889, Caracas, Venezuela.

President EARL B. NOBLE spoke on Association affairs before the Fort Worth Geological Society on May 20 and before the Houston Geological Society, May 27. At Houston he also gave some personal impressions of geological exploration in Paraguay.

The Executive committee of the Association met at the Blackstone Hotel, Fort Worth, Texas, May 20 and 21. All members were present: president EARL B. NOBLE, of Los Angeles; past-president MONROE G. CHENEY, of Coleman, Texas; vice-president PERRY OLCOTT, of Houston; editor GAYLE SCOTT, of Fort Worth; and EDWARD A. KOESTER, of Wichita, Kansas.

GEORGE ARTHUR WILLIAMS is working for the A. S. & R. Company of Mexico. His address is Cia. Minera Asarco, S. A., Apartado 85, Parral, Chihuahua, Mexico.

After July 15, J. WYATT DURHAM, of the Tropical Oil Company, Bogota, Colombia, may be addressed at the Department of Geological Sciences, California Institute of Technology, Pasadena, California.

C. W. HORTON is a research physicist in the Defense Research Laboratory, University of Texas, Austin.

ROBERT MCMILLAN has left the Frontier Refining Company. He is in charge of field operations for Geophoto Services, Inc., Denver, Colorado.

O. E. GRAM, recently with the Ohio Oil Company, is employed by the Union Producing Company of Shreveport, Louisiana, with offices in the Hamilton Building, Wichita Falls, Texas. He is organizing a geological department in the Wichita Falls district.

T. B. WILLIAMS, consultant of Calgary, Alberta, has been appointed Commissioner of the Petroleum and Natural Gas Commission, British Columbia Province, Department of Lands, Parliament Buildings, Victoria, British Columbia.

The following have been elected as officers of the North Texas Geological Society at Wichita Falls: president, DOLPHE S. SIMIC, Cities Service Oil Company; vice-president, LYNN L. HARDEN, Sinclair Prairie Oil Company; secretary-treasurer, TURNER WYNN, Stanolind Oil and Gas Company.

PAUL C. DEAN, of the firm of Dean Brothers, Fort Worth, discussed problems of secondary recovery in shallow north and west-central Texas oil fields at the semi-monthly luncheon meeting of the Fort Worth Geological Society, May 20.

HANS NORBISRATH is with the International Ecuadorian Petroleum Company, Apartado 803, Guayaquil, Ecuador.

The Syracuse University field courses in geology, offered annually in conjunction with Cornell College, at Camp Norton in the Rockies, are being held July 1–28 and August 1–28 in the Wind River Mountains of Wyoming, according to word from EARL T. APFEL, chairman of the department of geology at Syracuse University, Syracuse 10, New York.

Newly elected officers of the Oklahoma City Geological Society are: president, G. C. MADDOX, Carter Oil Company; vice-president, HAROLD J. KLEEN, Skelly Oil Company; secretary-treasurer, FREDERICK H. KATE, Shell Oil Company.

New officers of the Shawnee (Oklahoma) Geological Society are: president, DELBERT F. SMITH, Oklahoma Seismograph Corporation; vice-president, HENRY A. CAMPO, Atlantic Refining Company; secretary-treasurer, MARCELLE MOUSLEY (re-elected), Atlantic Refining Company.

K. A. SIMMONS, with W. C. McBride, Inc., for nearly 16 years, has resigned and will operate independently in the oil business. He is succeeded as division exploration manager at Evansville, Indiana, by KENNETH W. LEWIS, who has been in the geological department of the McBride Company since 1940.

F. E. TURNER, recently on the geological faculty of Texas Agricultural and Mechanical College, College Station, Texas, is now in the employ of The California Company, 1818 Canal Building, New Orleans, Louisiana.

The annual barbecue of the Pacific Section of the Association was held on May 17 and 18 in Pico Canyon, Los Angeles. The attendance was 208 men, a new high figure, according to A. S. HOLSTON, secretary-treasurer, of the Pacific Section.

FRANK N. BOSCO, of Denver, Colorado, has opened his consulting office at 838 Symes Building.

HENRY ROGATZ announces his release from service with the Army Air Forces and the reopening of his office as petroleum geologist at 407 Southland Life Building, Dallas, Texas.

On May 16, 1946, the following officers were elected for the 1945–1946 season of the

Mississippi Geological Society, Jackson, Mississippi: president, FREDERICK F. MELLEN, Mellen & Monsour, Box 2571, West Jackson Station; vice-president, J. B. WHEELER, Stanolind Oil and Gas Company; secretary-treasurer, H. L. SPYRES, Skelly Oil Company.

GEORGE DICKINSON, for many years subsurface geologist with the Caribbean Petroleum Company in Venezuela, has been transferred to Argentina and may be addressed c/o Diadema Argentina S.A. de Petroleo, Comodoro Rivadavia.

A. ARTHUR CURTICE, of New York, is advising the Government of Peru in framing a new oil law.

H. L. TIPSWORD, after having been in Venezuela and Colombia several years as micropaleontologist for the Socony-Vacuum Oil Company, is now with the Magnolia Petroleum Company at Lake Charles, Louisiana.

BENNETT FRANK BUIE is professor of geology at the University of South Carolina at Columbia. In addition to teaching courses in economic geology and mineralogy, he works as geologist for the Research and Planning Board, recently organized to promote industrial development in South Carolina. During World War II, Buie was Persian Gulf Command geologist and consultant for both Russian and Iranian governments. His decorations included: E. T. O. Ribbon, Bronze Star Medal, American Campaign Medal, Victory Medal, Order of the Red Star, U. S. S. R.

ISIAH BOWMAN, president of The Johns Hopkins University, Baltimore, Maryland, recently addressed the National Academy of Sciences in its first meeting since the war. He drew attention to the need for scientists to become familiar with, and adjust themselves to, the ways of politicians. The war brought scientists into public affairs and if they are to continue post-war participation in vital public affairs, scientists must learn something from the politicians' adaptability and willingness to compromise.

Colonel BYRON RIFE has been separated from the Army after 5½ years of service. His first assignment was as Executive Officer of Baytown Ordnance Works during the construction of the Government toluol plant at Baytown, Texas. Next he was made Commanding Officer of Missouri Ordnance Works during the construction of the anhydrous ammonia plant at Louisiana, Missouri. When headquarters was established at St. Louis for some 60 explosives manufacturing works and loading plants, he was made Executive Officer to the Field Director in charge of these plants. Later he was given command of two of the largest explosives manufacturing and loading plants, the Kankakee Ordnance Works and Elwood Ordnance Plant. After V-J Day he was given the assignment of consolidating these two plants into one command as the Joliet Arsenal. Colonel Rife wears the Legion of Merit and the Army Commendation Ribbon. He will reside with his wife and two sons at 702 West Euclid Street, San Antonio 1, Texas.

The final meeting of the season was held by the Illinois Geological Society, May 22, at Olney. Officers elected for the next year are: president, JACK HIRSCH, Texas Company; vice-president, E. E. REHN, Sohio Petroleum Company; secretary-treasurer, JOHN B. PATTON, Magnolia Petroleum Company. The subject of the meeting was a Devonian Symposium at which the principal address was given by L. E. WORKMAN, head of the subsurface division of the Illinois Geological Survey. Shorter papers on other aspects of the Devonian of the Illinois basin were also given by JAMES LEWARK, Carter Oil Company, on the Loudon field; ED COMBS, Sun Oil Company, on Devonian correlations in Indiana; JOHN PATTON, Magnolia Petroleum Company, on the Salem field; and R. H. MARTIN, Texas Company, on the Boulder field.

LEO SWICK, of the Magnolia Petroleum Company, has been transferred from the Mt. Vernon, Illinois, district office to the Wichita Falls, Texas, district office.

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First National Bank Building

Secretary-Treasurer - - - - - A. W. Cullen
1024 Continental Oil Building

Luncheons every Friday noon, Cosmopolitan Hotel. Evening dinner (6:15) and program (7:30) first Monday each month or by announcement, Cosmopolitan Hotel.

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TALLAHASSEE, FLORIDA

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The California Company

Vice-President - - - - - - - - Walter B. Jones
Geological Survey of Alabama

Secretary-Treasurer - - - - - - H. A. Sellin
Magnolia Petroleum Company

Meetings will be announced. Visiting geologists and friends are welcome.

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ILLINOIS GEOLOGICAL SOCIETY

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The Texas Company, Mattoon

Vice-President - - - - - - - - - E. E. Rehn
Sohio Petroleum Company

Secretary-Treasurer - - - - - John B. Patton
Magnolia Petroleum Company

Meetings will be announced.

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INDIANA-KENTUCKY GEOLOGICAL SOCIETY
EVANSVILLE, INDIANA

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Sun Oil Company, Box 717

Vice-President - - - - - Hillard W. Bodkin
The Superior Oil Company

Secretary-Treasurer - - - - Charles W. Honess
Gulf Refining Company, Box 774

Meetings will be announced.

KANSAS

KANSAS GEOLOGICAL SOCIETY
WICHITA, KANSAS

President - - - - - - Harold O. Smedley
Skelly Oil Company

Vice-President - - - - - - - Paul A. Harper
Cities Service Oil Company

Secretary-Treasurer - - - Francis E. Mettner
Transwestern Oil Company
605 Union National Bank Building

Regular Meetings: 7:30 P.M., Geological Room, University of Wichita, first Tuesday of each month. The Society sponsors the Kansas Well Log Bureau, 412 Union National Bank Building, and the Kansas Well Sample Bureau, 137 North Topeka.

LOUISIANA

NEW ORLEANS GEOLOGICAL SOCIETY
NEW ORLEANS, LOUISIANA

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The Texas Company, P.O. Box 252

Vice-President and Program Chm. - - - - - - - - - - - - - - R. R. Copeland, Jr.
The California Company, 1818 Canal Bldg.

Secretary-Treasurer - - - - - R. W. Bybee
Humble Oil and Refining Co., 1405 Canal Bldg.

Meets the first Monday of every month, October-May inclusive, 7:30 P.M., St. Charles Hotel. Special meetings by announcement. Visiting geologists cordially invited.

LOUISIANA

THE SHREVEPORT GEOLOGICAL SOCIETY
SHREVEPORT, LOUISIANA

President - - - - - - - - - T. H. Philpott

Vice-President - - - - - Van D. Robinson
Atlantic Refining Company

Secretary-Treasurer - - - - - W. E. Wallace
Sohio Petroleum Corporation, Atlas Building

Meets monthly, September to May, inclusive, in the State Exhibit Building, Fair Grounds. All meetings by announcement.

LOUISIANA

SOUTH LOUISIANA GEOLOGICAL SOCIETY
LAKE CHARLES, LOUISIANA

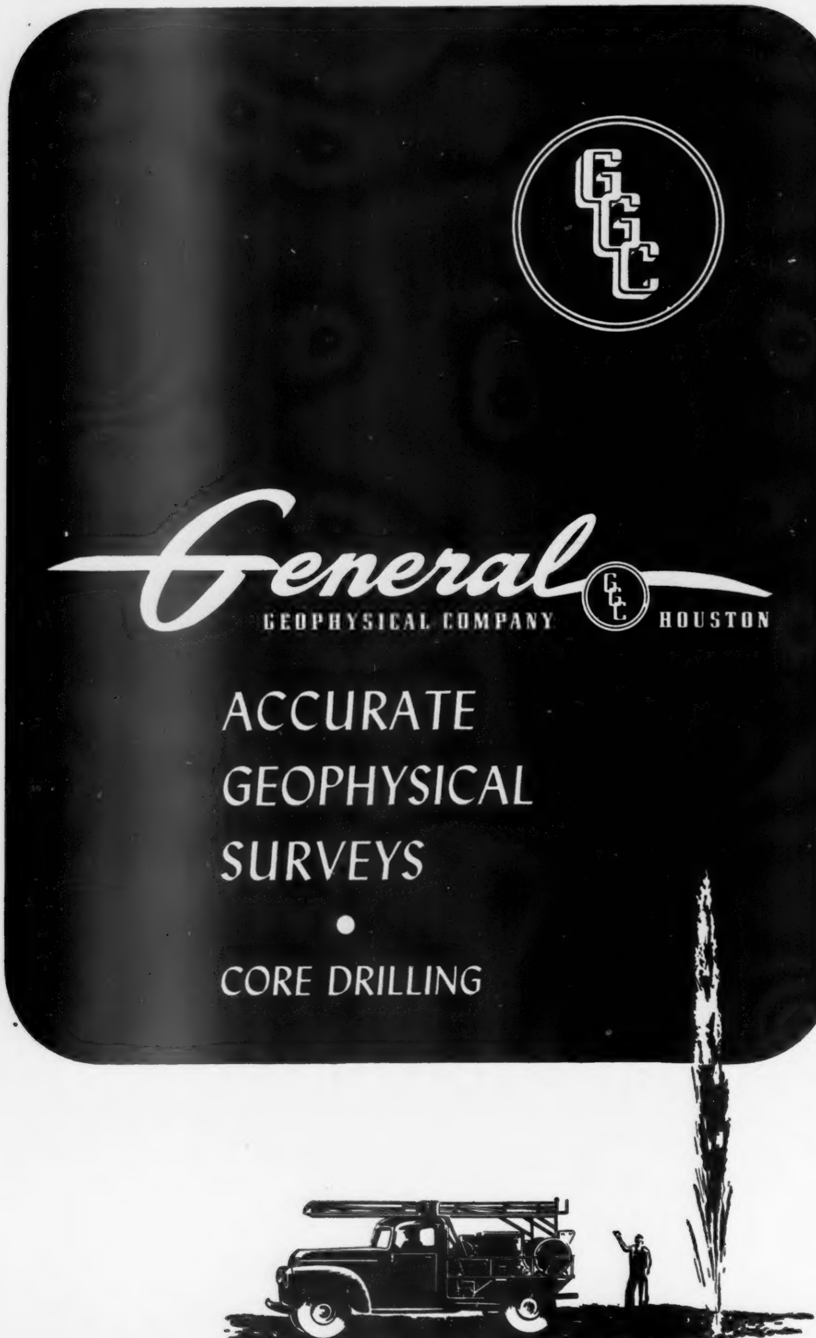
President - - - - - - - - - - - J. A. Moore
Union Sulphur Company

Vice-President - - - - - - - James M. Bugbee
Shell Oil Company, Inc.

Secretary - - - - - - - - - - Lloyd D. Traupe
Ohio Oil Company

Treasurer - - - - - - - - - D. E. Newland
Magnolia Petroleum Company

Meetings: Dinner and business meetings third Tuesday of each month at 7:00 P.M. at the Majestic Hotel. Special meetings by announcement. Visiting geologists are welcome.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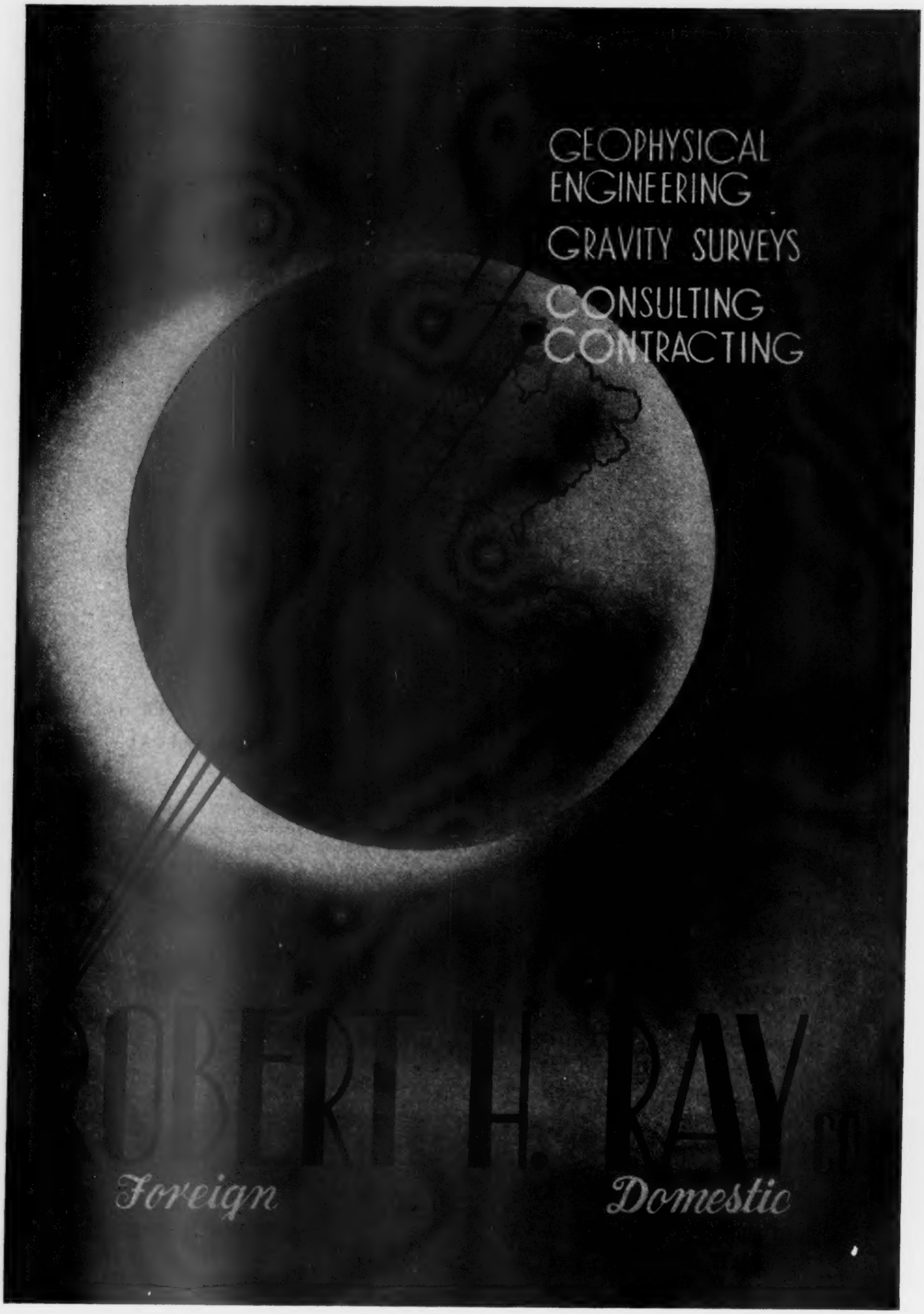
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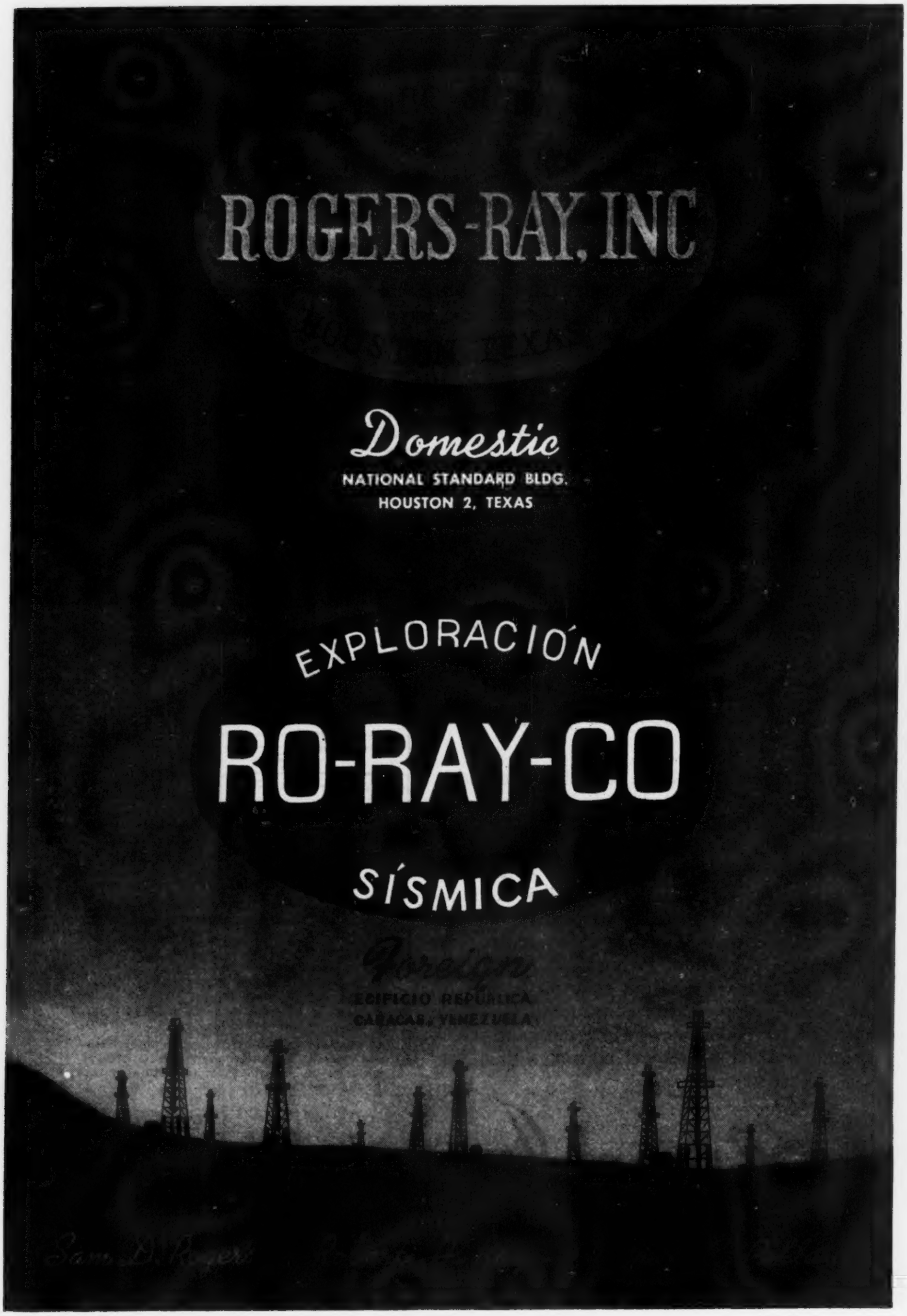
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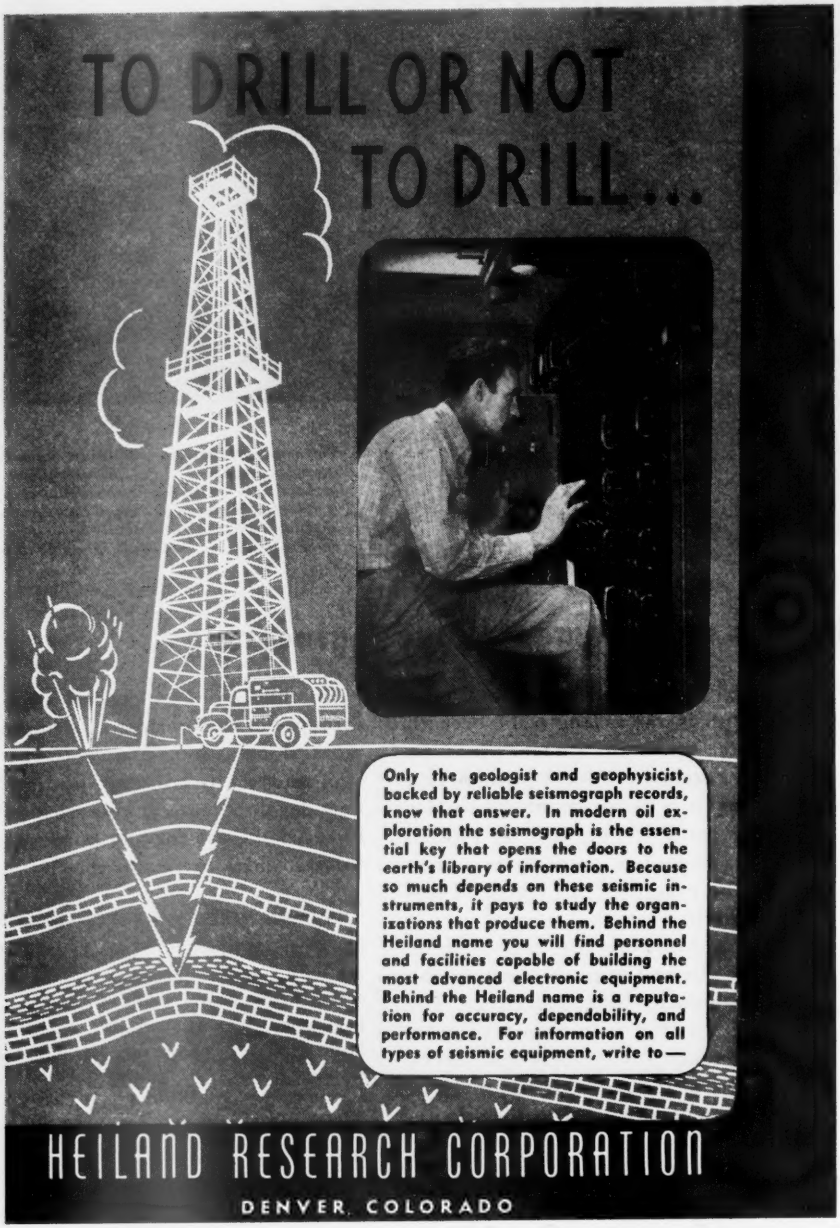
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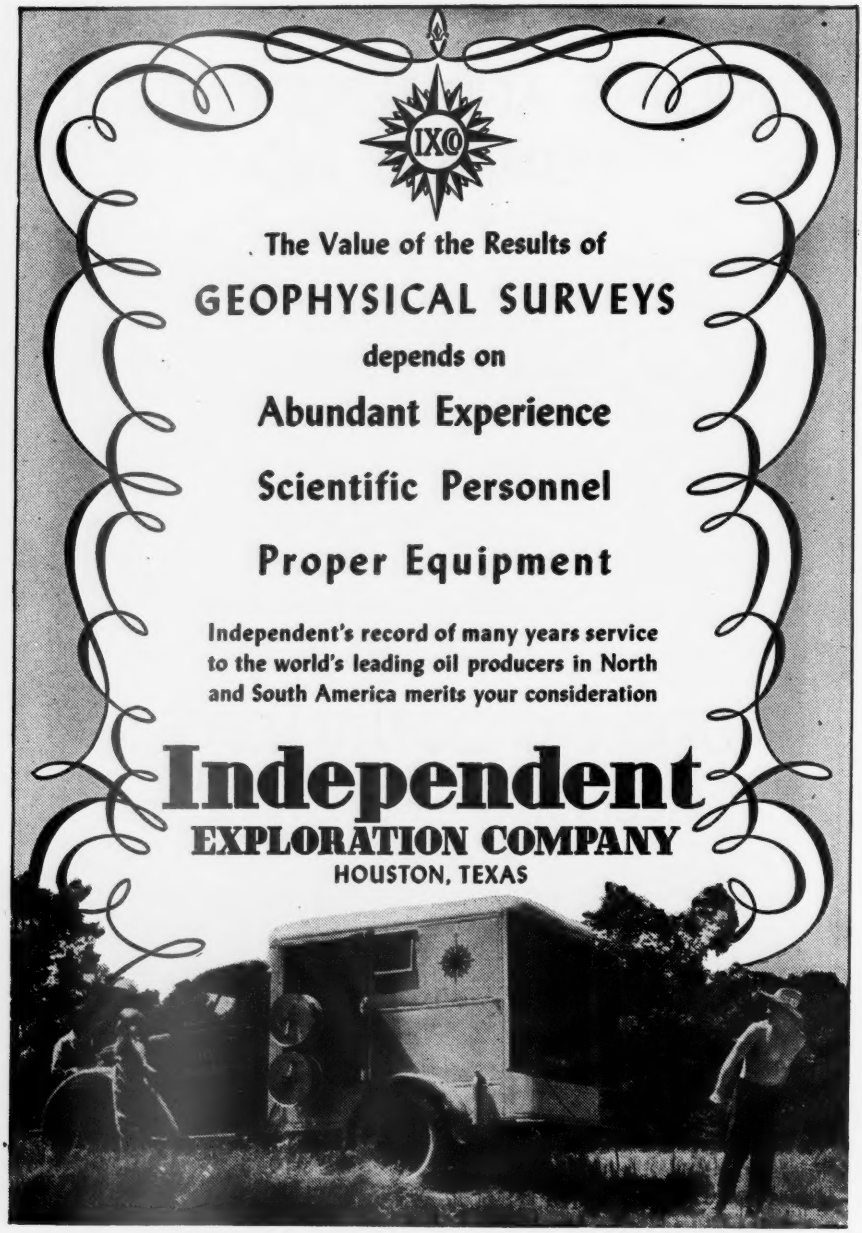
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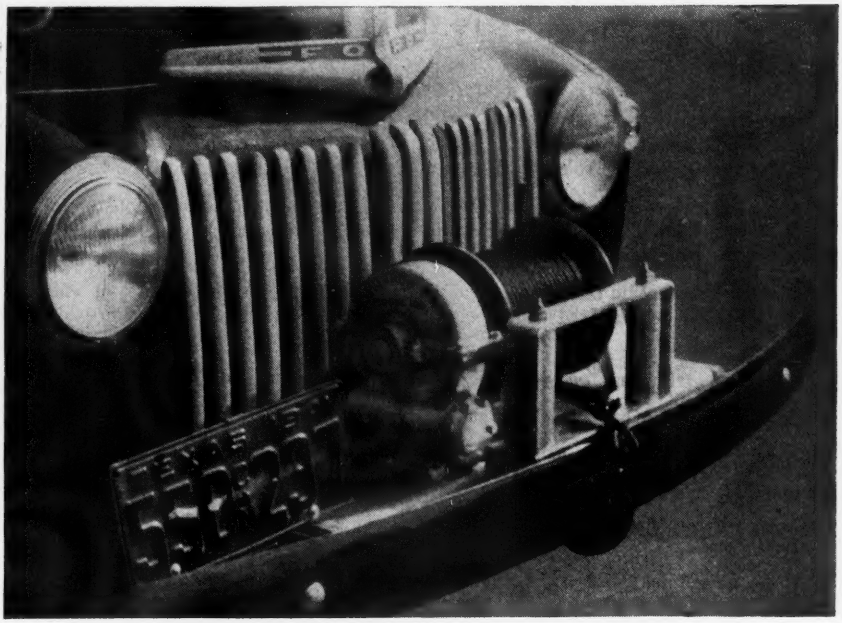

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SIDE WALL CORING TOOL

The HOMCO Side Wall Coring Tool cuts side wall cores of adequate size for complete analysis. It is designed to run on conventional drill stem and to recover cores by means of a retractable core barrel run in through the drill stem and retracted with a wire line overshot and assembly. Any number of cores can thus be obtained without pulling the working string and the tool body from the hole.

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Figure 1 shows core tube as it enters side wall. Figure 2 shows resting position after core is taken. Cores are 1" to 1¼" diameter by 4" to 10" length.

E. F. Gahan, Export Representative, 500 Fifth Ave., New York 18, N.Y.

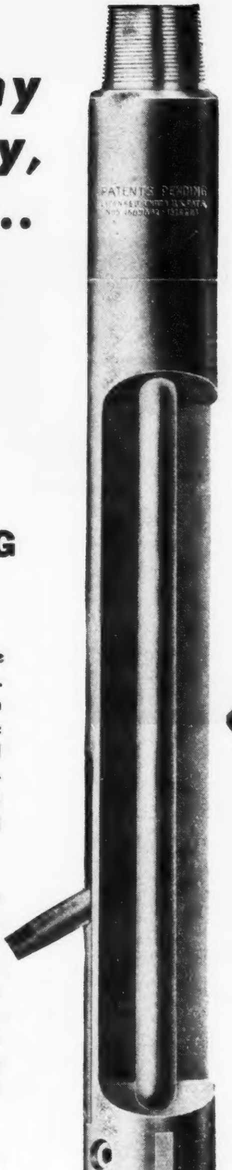

Figure 1


Figure 2

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HOUSTON, TEXAS

PRICE LIST OF THE BULLETIN

THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

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The monthly *Bulletin* contains authoritative major articles on petroleum geology and allied subjects, and minor notes, discussions, and reviews. Annual subscription, $15.00 (outside United States, $15.40). Contents of Vols. I–XX (1917–1936) are indexed in detail in the *Comprehensive Index* of all A.A.P.G. publications (1917–1936); these volumes and the Index may be consulted at Association headquarters and in many college and public libraries. Volumes and numbers remaining for sale are listed here. Educational institutions are invited to write for special prices on part or complete sets insofar as available.

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1937 VOL. XXI.—Each number ($1.00) 1.50

NO. 11—134 pp. ARK.: Pennsylvanian. GEN.: Evaluation of petroleum index of refraction; colorimetric determination of oil open-space replacements. KAN. and OKLA.: Source beds. RUSSIA: Urals. TEX.: Laredo.

NO. 12—129 pp. ARABIA: "Black Sea" conditions in Arabian Sea. KAN.: Permian. N. Y.: Oriskany. OKLA.: Permian. PA.: Oriskany. TEX.: Sand Hills, Crane Co.

1938 VOL. XXII.—Each number ($1.00) 1.50

NO. 2—112 pp. CALIF.: Santa Monica Bay. GEN.: Repressuring; graptolites. LA.: Aragonite in salt-dome cap rocks. MICH.: Mississippian gas sands. TEX.: Aragonite. W. VA.: Oriskany series.

NO. 4—124 pp. GEN.: Appalachian field history; bibliography of structure maps and sections of oil states; folds in three dimensions. MICH.: Oil and gas.

NO. 5—116 pp. GEN.: Future of geologist; Oriskany sandstone petrology; geological limitations to oil law. N. MEX.: New section of Trinity age.

NO. 9—172 pp. APPAL.: Gas. ARABIA: Red Sea. CANADA: McMurray. GEN.: Reservoirs; 100 years ago; wildcats; secondary tilt; porosity; permeability; index determination. LA.: Shreveport. TEX.: Refugio, Segno, Cleveland pools. VENEZ.: Central.

1939 VOL. XXIII.—1,922 pp. 12 Nos. Each number ($1.00) 1.50

NO. 1—120 pp. CALIF.: Reef Ridge shale; Santa Maria Valley field. NEB.: Agate anticline. UTAH: "Park City" beds, Uinta Mts.

NO. 2—160 pp. LA.: Vicksburg fauna. OKLA.: Keokuk pool. TEX.: Harris Co.; heaving shale. UTAH: Washington Co.

NO. 3—180 pp. LA.: Lisbon. OKLA.: Osage. TEX.: McFadden Beach.

NO. 4—164 pp. CALIF.: Ridge Basin. LA.: Barataria Bay. MO.: Bainbridge formation. MONT.: Baker-Glendive anticline. OKLA.: Verden shoestring. TEX.: Orange field; salt erosion, Gulf. U.S.S.R.: Salt domes. WYO.: Wind River Canyon.

NO. 5—140 pp. GENERAL: Two tilts. KAN.: Greenwich pool. OKLA.: Dora pool. PERU: Agua Caliente anticline. TEX.: Travis Peak formation; Fairbanks and Satsuma fields. TURKEY: Southern.

NO. 6—218 pp. REVIEW OF DEVELOPMENTS.

NO. 7—180 pp. GEN.: Rock units. KAN.: Hugoton gas. OKLA.: Arbuckle asphalt. TEX.: Panhandle gas; Carlos structure and Ferguson Crossing, Grimes and Brazos Cos.

NO. 8—124 pp. ARK.: Basilosaurus. CALIF.: Potrero Hills gas. GEN.: Rocky Mtns.; black shale. KAN.: Loess. LA.: Stream patterns. S. DAK.: Pennington Co. TEX.: Ben Bolt and Magnolia City fields, Jim Wells Co.; Muralla field, Duval Co. TRINIDAD.

NO. 9—148 pp. GEN.: Isostatic layer; electrical logging; Gulf datum planes. ILL., IND., KY.: Coals; Salem field, Marion Co. MISS.: Jackson Eocene, TEX.: Proration.

NO. 10—164 pp. ALA.: Citronelle. CALIF.: Wasco field, Kern Co. GEN.: Oligocene-Miocene. ILL.: Basin fields; Pennsylvanian; Cambrian inlier. N. MEX.: Salado formation. TEX.: Goldsmith field, Ector Co.; Salado. WYO.: Wind River Canyon.

NO. 11—148 pp. FLA.: Everglades deep test. GEN.: Permian; marine and non-marine sediments. NEB.: Permian. N. MEX.: Castile salt, potash, anhydrite. TEX.: Gulf Coast; Amelia field, Jefferson Co.; Permian.

NO. 12—172 pp. GEN.: Drilling time; Cincinnati arch. KAN.: Permian. KY.: St. Peter; McClosky productive areas. LA.: Starks field, Calcasieu Parish.

1940 VOL. XXIV.—2,232 pp. 12 Nos. Paper. Each number........................($1.00) 1.50

NO. 2—200 pp. GEN.: Permian and Carboniferous; economics; sedimentation; geophysical interpretation; Frio formation, Gulf Coast. ILL.: Chester and Iowa series. SUMATRA: Oeloe Aer fault zone.

NO. 3—208 pp. GEN.: Gulf Coast Miocene; barium in Appalachian brines. LA.: Miocene; interior salt domes. OHIO: Secondary recovery. OKLA.: Morrow group, Adair Co. TEX.: Apco structure, Pecos Co.: Sejita structure, Duval Co.

NO. 4—148 pp. ARK.: Dorcheat pool, Columbia Co. AUSTRALIA: Permian. CALIF.: Whittier Quadrangle; Kettleman Hills; Paloma field, Kern Co. COLO.: Permian. LA.: Sparta-Wilcox. MINN.: Pre-Cambrian, Cambrian. OHIO: Paleozoic, pre-Cambrian, Delaware Co. OKLA.: Osage, Washington, Nowata Cos.; deepest well, Washita Co. TEX.: Lissie and Beaumont, Gulf Coast; Sparta-Wilcox; shoreline, Brazoria Co.

NO. 5—188 pp. GEN.: Mississippian, Eastern Interior; geochemical exploration.

NO. 6—204 pp. RECENT DEVELOPMENTS.

NO. 7—196 pp. CALIF.: Rio Bravo field, Strand field, Kern Co. TEX.: Cretaceous ammonoids. WYO.: Oil-field waters.

NO. 8—176 pp. GEN.: Exploration methods; young graduates and field experience; source of hydrogen; underground gas storage. IA.: Wildcat well, Union Co. TEX.: Henderson pool. Clay Co.; K.M.A. field, Wichita Co.

NO. 9—176 pp. CANADA: Turner Valley Paleozoic limestone. CALIF.: Bakersfield Eocene coal. COLOMBIA: Jurassic-Cretaceous. GEN.: Radioactivity of rocks; GULF: Cook Mtns. N. MEX.: Caballos novaculite. TENN.: Lower Ordovician (St. Peter). VENEZUELA: Jurassic-Cretaceous. W. INDIES: Paleogene of Barbados.

NO. 10—160 pp. CALIF.. History; Eocene Yokut sandstone. GEN.: Paleontology. KAN.: Hugoton field porosity, permeability. TEX.: Saxet field, Nueces Co.; Rogers pool and Bonita discovery, Montague Co.; Aspermont pool, Stonewall Co.

NO. 11—204 pp. CALIF.: San Joaquin Valley Eocene. GEN.: Carbohydrates of oil and coal; unconformities and accumulation. LA.: Wilcox Eocene; Neale, Beauregard Parish. MICH.: Buckeye, Gladwin Co. MISS.: Surface. OKLA.: Ramsey, Payne Co.; Billings, Noble Co. TEX.: Wilcox Eocene; Pittsburg, Camp Co. W. VA.: Devonian.

NO. 12—164 pp. CALIF.: Miocene fishes, Torrance field. GEN.: Water cones; Permian crude. LA.: Gulf heavy minerals. MICH.: Isopach, Ellsworth-Traverse limestones. OKLA.: Structural interpretation, gravity anomalies. TEX.: Gulf heavy minerals; Hoffman field, Duval Co.; Jones Co. TRINIDAD: Los Bajos fault.

1941 VOL. XXV.—Each number..($1.00) 1.50

NO. 12—167 pp. GEN.: Shadowgraphic maps; free-oil deposition; traceslip faults; stratigraphy; radioactivity logging. N. MEX.: Sacramento Mtns. Mississipian.

1942 VOL. XXVI.—1,893 pp. 12 Nos. Paper. Each number........................($1.00) 1.50

NO. 2—152 pp. CALIF.: Stratigraphy; Cretaceous; Del Valle field, Los Angeles Co. GEN.: Free oil accumulation. TEX.: Sewell-Eddleman area, Young Co.; Permian paleogeography; Eocene, Zapata Co.; Washburn field, La Salle Co.; McKee and Waddell sands, Simpson Ordovician, West Texas. UTAH: Laccolithic mountains, traps.

NO. 3—228 pp. CALIF.: Earthquake, Dominquez field, Los Angeles Co. GEN.: Member list; auditor's report. KAN.: Patterson pool, Kearny Co. MONT.: Madison Mississippian. N. DAK.: Stratigraphy. RUSSIA: Artinskian Permian. TEX.: Pre-Cretaceous, Edwards Plateau; Barnhart field, Reagan Co.

NO. 5—204 pp. CALIF.: Sutter Buttes. COLOMBIA: Honda district. GEN.: Pseudo-abyssal sediments; salty ground waters, Atlantic and Gulf coasts; oil-field waters; annual reports. MONT.: Cedar Creek anticline. TEX.: Silurian graptolite, Crane Co.

NO. 6—216 pp. RECENT DEVELOPMENTS

NO. 7—132 pp. ARK.: Developments; Midway field, Lafayette Co. GEN.: Annual addresses; exploration; geology, war, peace; teaching; drilling-time logs; appraisals, oil reservoirs. GULF: Tertiary microfossils. LA.: Developments.

NO. 8—124 pp. COLO.: Gore area. GEN.: Discovery methods. MONT.: Oil-field water. N. DAK.: Stratigraphy. TEX.: Ellenburger; Pennsylvanian anhydrite.

NO. 9—136 pp. ARK.: Schuler field, Union County. NEB.: Cretaceous. TEX.: Well spacing, Columbia field, Brazoria Co.

NO. 10—140 pp. CALIF.: Crocker Flat, Temblor Range. COSTA RICA: Amoura shale. GEN.: Lantern-slide copy. ILL.-IA.: Pennsylvanian. ILL.-IND.: Chester sandstone; New Harmony field. LA.: Morehouse Paleozoic. N., S. DAK.: Regional. TEX.: Payton pool, Pecos and Ward Cos.

NO. 11—98 pp. GEN.: Stratigraphical analysis and environmental reconstruction. TEX.: Graptolites, Crane Co.

NO. 12—98 pp. GEN.: Engineering geology; calculating thickness; annual index.

1943 VOL. XXVII.—1,674 pp. 12 Nos. Paper. Each number........................($1.00) 1.50

NO. 4—154 pp. MEX.: Upper Jurassic. ROCKY MTNS.: Structure. TEX.: Wasson field, Yoakum and Gaines Cos.; Embar field, Andrews Co. VA.: Natural coal gas.

NO. 5—134 pp. CALIF.: Tertiary. GEN.: Annual reports. GULF: Tuscaloosa formation. KAN.-OKLA.: Desmoinesian, Missourian. MICH.: Thunder Bay Traverse rocks. S. DAK.: Rapid City water wells. TEX.: Seguin formation; Dockum conglomerates.

NO. 6—172 pp. RECENT DEVELOPMENTS.

NO. 7—152 pp. GEN.: Annual addresses; discovery thinking; geology, paleontology, geophysics, reserves, discoveries, economics, war; developments, SE. U.S.; cabletool logs.

NO. 8—136 pp. LA.: Anse La Butte, St. Martin Ph.; Jennings field, Acadia Ph. TENN.: Structure. TEX.: L. Cret. foraminifera and ostracoda; ground water at Houston.

NO. 9—112 pp. GEN.: Marine micro-organisms and petroleum; faults. TEX.: Pre-Trinity. W. VA.: Metamorphism of coal.

NO. 10—120 pp. CALIF.: Santa Maria district; Eocene, Chico Martinez area. GREAT PLAINS: Big Snowy group. OKLA.: Simpson graptolites. ROCKY MTNS.: Crude oils.

NO. 11—160 pp. GEN.: Aerial photographs. GULF: Jurassic. VA.: Deep well, Russell Co. W. VA.: Deep well, Harrison Co.

NO. 12—112 pp. CALIF.: Radiolarites, Santa Maria basin. GEN.: Chemical analysis of crudes. N. DAK.: Tertiary; Williston basin. OKLA.: Spavinaw granite. VENEZUELA: Fossils in metamorphics.

1944 VOL. XXVIII.—1,812 pp. 12 Nos. Each number.............................($1.00) 1.50

NO. 1—172 pp. GEN.: Oil in cuttings. ILL.: Bethel sandstone. KAN.: Carmi pool, Pratt Co. MISS.: Geology. TEX.: Algal reefs, Terlingua district. VENEZUELA: Anzoategui.

NO. 3—148 pp. ARK.: Developments, 1942. GEN.: Membership; audit. LA.: Developments, 1942. MEX.: Northern geology.

NO. 4—128 pp. CALIF.: Cretaceous and Paleocene, Santa Lucia Range. KY.: "Corniferous," Estill Co. LA.: Grabens; developments, 1942. TEX.: Pecan Gap, Wolfe City, and Annona formations; highest structural point; grabens.

NO. 5—124 pp. GEN.: Annual reports; velocity corrections; reserve estimates. GULF: Cotton Valley beds.

NO. 6—196 pp. RECENT DEVELOPMENTS. COLOMBIA: Free oil in ammonites. OKLA.: Viola graptolites.

NO. 7—180 pp. CALIF.: Tumey sandstone, Fresno Co.; exploratory wells. GEN.: Annual addresses: radioactivity and petroleum genesis; paleoecology, Middle Permian. MIDDLE EAST: Oil mission. MISS.: Field and salt-dome names. OHIO: Petroliferous iron ore. OKLA.: Broken Arrow coal, Rogers, Wagoner, and Tulsa Cos. TEX.: Miocene; elasticity of reservoir, E. Tex.; dolomite porosity in Devonian, W. Tex.

NO. 8—172 pp. COLOMBIA: Thrust fault. GEN.: Data on oil reserves. MEX.: Cretaceous. WYO.: Como Bluff anticline, Albany and Carbon Cos.

NO. 9—168 pp. GEN.: Stratigraphic thickness in parallel folds. GULF: Oligocene; Anahuac formation. LA.: Structure of deep domes. MO.: Bourbon High, Crawford Co.

NO. 10—144 pp. ARGENTINA: Tupungato field, Mendoza. CHINA: General geology; Red Basin, Szechuan province. E. INDIES: Sedimentary basins. GEN.: Petroleum distribution; origin and accumulation; elevations with plane table and speedometer. ILL.: Devonian subsurface; Sandoval pool, Marion Co. TEX.: Concord salt dome, Andrews Co.; fossils in Buda limestone, Denton Co.; Fullerton pool, Andrews Co.

NO. 11—112 pp. APPAL.: Underground gas storage. ARK.: Moorefield formation and Ruddell shale, Batesville district. COLOMBIA: Thrust fault. NEW MEX.: Upper Permian Ochoa series, Delaware basin. TEX.: Upper Permian Ochoa; salt diffusion in Woodbine sand; ammonoids in upper Cherry Canyon, Delaware group; South Tyler, and

Sand Flat fields, Smith Co. VENEZUELA: Fusulinids, La Quinta formation.

NO. 12—140 pp. FLA.-GA.: Stratigraphy, structure. GEN.: Index; reservoir data.

1945 VOL. XXIX.—1,824 pp. 12 Nos. Each number .... ($1.00) 1.50

NO. 2—128 pp. GEN.: Mississippian and Pennsylvanian of N. Amer.; size distribution of sand. LA.: Ruston gas field, Lincoln Parish. OKLA.: Thrust faulting, Arbuckle Mtns. TEX.: Cretaceous, Tyler basin; South Houston salt dome and oil field, Harris Co.; crystalline rocks in deep well, Winkler Co.; deep test, Moore Co.

NO. 3—160 pp. GEN.: Maddox spoon; origin of petroleum; members; financial. TEX.: Rise of water level to defective gas well, Harris Co.; Deep test, Culberson Co.

NO. 4—64 pp. ARK.: Calhoun field, Columbia Co. GEN.: Paleogeographic and palinspastic maps. MONT.: Jurassic Ellis formation. OKLA.: Graptolites, Carter Co. TEX.: Lower Ordovician and Upper Cambrian.

NO. 5—152 pp. GEN.: Annual reports; Wallace Pratt, Powers medalist; college geology students. KAN.: Ness Co. MICH.: Silurian brine, Bay City. S. AMER.: Oil possibilities.

NO. 6—228 pp. RECENT DEVELOPMENTS. TEX.: New Hope field, Franklin Co.; Bacon limestone, E. Tex.

NO. 7—208 pp. ATLANTIC COASTAL PLAIN: Subsurface. CALIF.: Upper Cretaceous in Great Valley. GEN.: Presidential addresses; middle Jurassic in Western Interior; geological calendar. MISS.: Upper Cretaceous fossils from wells. OKLA.: Graptolites, Carter Co. TEX.: Igneous rocks from deep wells. W. Tex.

NO. 8—168 pp. ALBERTA: Reservoir, Turner Valley. COLOMBIA: Petroleum geology. GEN.: Time of oil accumulation; textural standard for sample logs; research in exploration. LA.: Ground-water geology, Camp Polk. MD.: Deep test, Wicomico Co. UTAH: Mississippian and Pennsylvanian, Dry Lake, Logan Quadrangle.

NO. 9—144 pp. GEN.: Recent sedimentation and search for petroleum; vertical source in oil and gas accumulation. GULF COAST: Sedimentation. MONT.: Marine Jurassic, Sweetgrass arch. TEX.: Pre-Permian axes of deposition, W. Tex.

NO. 10—160 pp. GEN.: Radioactivity, organic content, sedimentation; photography of megafossils; research program. ORE.: Geology and oil and gas. TEX.: Subsurface Lower Cretaceous, S. Tex. WASH.: Geology and oil and gas.

NO. 11—156 pp. ALBERTA: Cretaceous of Vermilion area. COLO.: Las Animas arch, Lincoln, Cheyenne, Kiowa Cos. GEN.: Petroleum reservoirs; exploratory drilling, 1938–1944; strength of the earth. ILL.: Rosiclare-Fredonia contact, Hardin and Pope Cos. ROCKY MTNS.: Developments, 1944.

NO. 12—132 pp. GEN.: Classification of oil and gas accumulations; use of aerial photographs; Permian Word formation; surface and seismic exploration party. TEX.: Coastal Plain Quaternary and Oakville, Cuero, and Goliad formations; Balcones, Luling, and Mexia fault zones; Pickton field, Hopkins Co.; Merigale field, Wood Co.

1946 VOL. XXX.— pp. Each number .... ($1.00) 1.50

WHOLE VOLUME: Bound in two parts. Cloth .... ($4.00) 17.00

NO. 1—156 pp. CALIF.: Los Banos district, San Joaquin Valley. E. INDIES: Oil basins; reef corals. GEN.: Hydrocarbons from fatty acids; submarine slumping; Paleozoic conodonts; classification of oil possibilities; naming multiple sands. TEX.: Waller and Harris Cos.; Devonian "pay," TXL pool, Ector Co.

NO. 2—148 pp. ALA.: Pre-Selma Up. Cretaceous. ALBERTA: Jurassic-Cretaceous. GEN.: Origin of continental shelves. MONT.: Jurassic-Cretaceous boundary. ORE.: Up. Nehalem River basin. PERU: SE. reconnaissance. TEX.: Katy field, Waller Co.; Low. Pennsylvanian terminology.

NO. 3—172 pp. ECUADOR: Up. Cretaceous and Paleocene micropaleontology. EUROPE: Carpathian oil fields. GEN.: Porosity through dolomitization; members; financial. NEBR.: Boice shale, Mississippian. WEST VA.: Drill cuttings.

NO. 4—168 pp. ARGENTINA: San Pedro oil field, Salta. ARK.: Penters chert, Batesville. CALIF.: Miocene conglomerates, Puente and San Jose Hills. COLO.: Gramp's field, Archuleta Co. GEN.: Redox potential of marine sediments; asphaltic sands. MEX.: Caborca, Sonora. S. AM.: Tectonic framework. SINAI: Triassic conodonts.

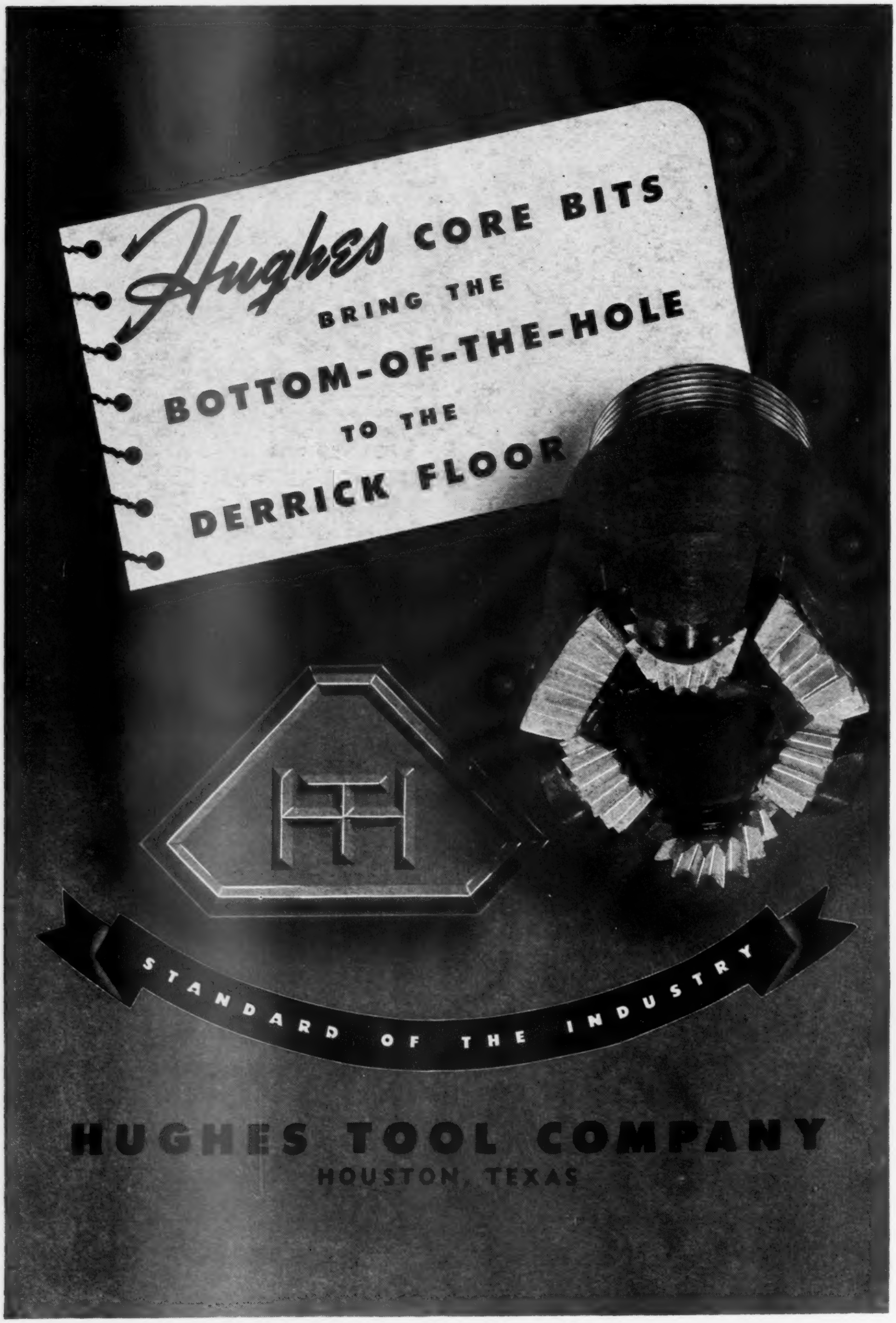
NO. 5—168 pp. ALA.: Vick formation, pre-Tuscaloosa. GEN.: Organic material into petroleum; "Jacob staff"; aerial photography; annual reports and minutes; college geology students. KAN.: buried pre-Cambrian hills, Barton Co.

NO. 6—264 pp. RECENT DEVELOPMENTS. PERU: Southeastern reconnaissance. TURKEY: Harbolite, carbonaceous hydrocarbon.

NO. 7— pp. GEN.: Presidential addresses; science legislation; geologists in military service; production engineering; grain roundness; mss. preparation. TEX.: Gas reserves; Quaternary. VA.-TENN.: Ordovician.

NO. 8— pp. GEN.: Geological directory. KAN.: Siluro-Devonian. MON.: Ellis, Amsden, Big Snowy group, Judith basin. UTAH: Paleozoic-Mesozoic, Uinta Mtns.

NO. 9— pp. ALASKA: Possibilities. FRANCE: Aquitaine basin. GERMANY: Oil fields. UNITED KINGDOM: Occurrence of oil.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